DIESEL POWER

AND DIESEL TRANSPORTATION

JULY, 1953

For 20 years—
"MAINTENANCE CONSISTENTLY

WHEN the first two Diesels went into the Vermillion, S. D., power plant in 1932, *Texaco Ursa Oil* went in with them.

"The freedom *Texaco Ursa Oil* gave us from lubrication troubles," says Chief Engineer Armagost, "naturally led to our using it in other engines that were installed in 1937 and 1947. Year after year our equipment has run remarkably clean, with minimum wear and maintenance and fuel costs consistently low."

The foregoing is one more example of the year-in, year-out fine performance that operators everywhere are getting with *Texaco Ursa Oils* in Diesel, gas and dual-fuel engines.

A Texaco Lubrication Engineer will gladly tell you all about the complete line of *Texaco Ursa Oils,* and help you select the proper ones to assure top performance from your engines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

VERMILLION, S. D., Municipal Power Plant. The 750 h.p. Worthington Diesel engine shown was originally installed in 1937. It was converted to dual-fuel and stepped up to 1200 h.p. in 1949. Other engines in plant are two 525 h.p. Fairbanks-Morse Diesels installed in 1932, and a 1300 h.p. Fulton dual-fuel engine installed in 1947. Plant has been 100% Texaco-lubricated since 1932.

TEXACO

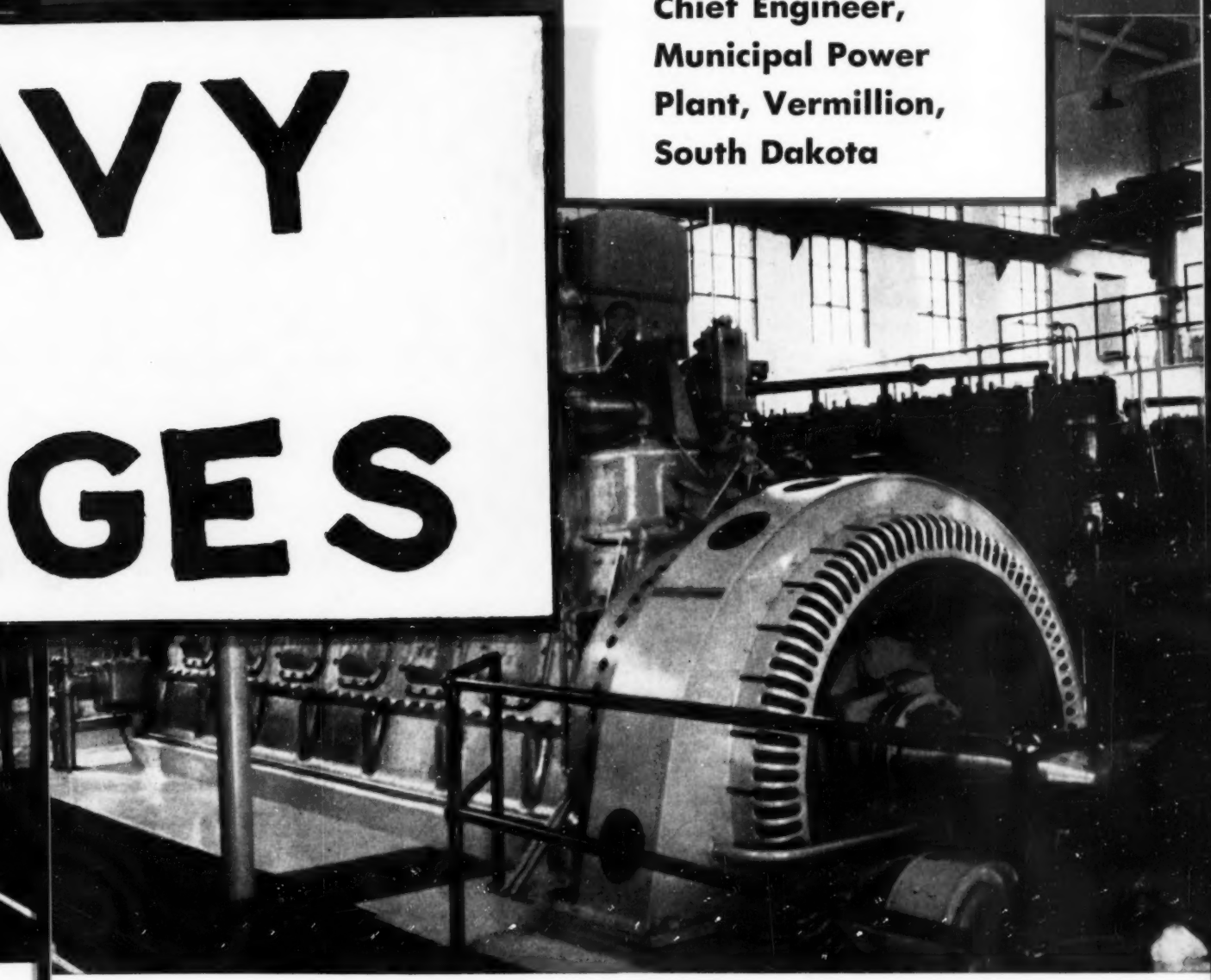
TEXACO

AND FUEL COSTS LOW"

—Earl Armagost, Chief Engineer, Municipal Power Plant, Vermillion, South Dakota

AVY

GES



URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

For 20 years—

"MAINTENANCE CONSISTENTLY

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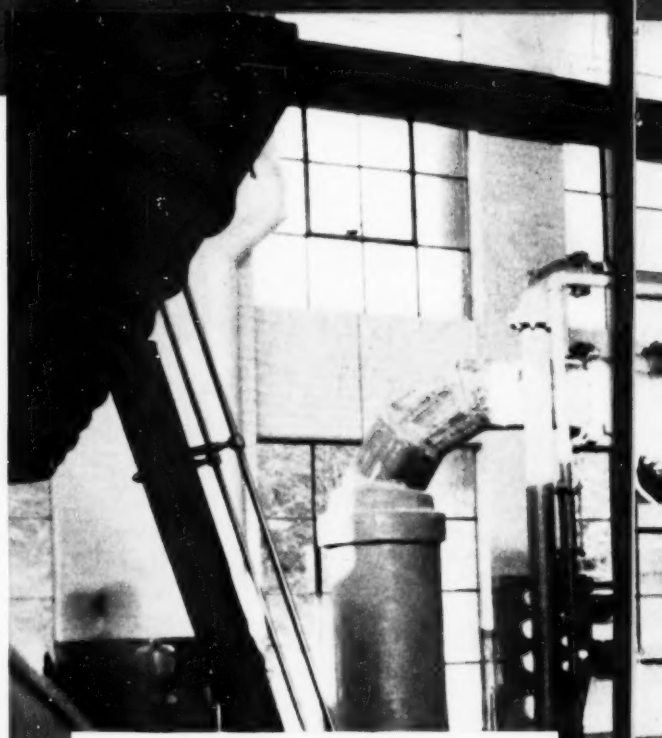

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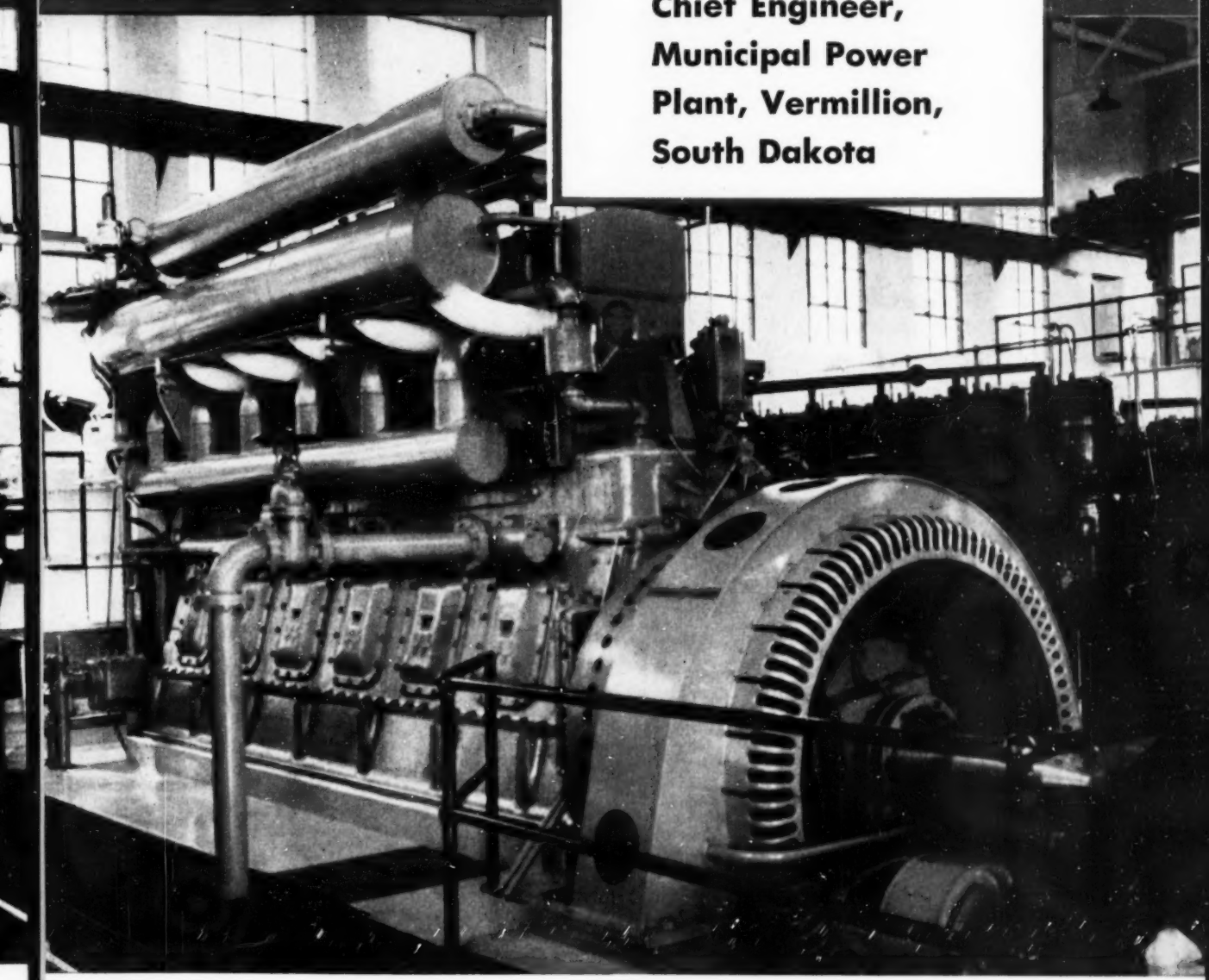
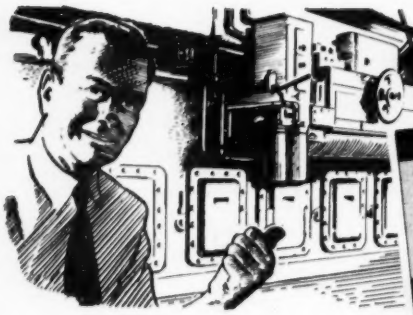


URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

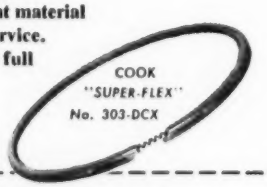
5000 HOUR "ON-THE-JOB" TEST* PROVES COOK "JOB-ENGINEERED" RINGS BEST



	Before Installing COOK PISTON RINGS	After Installing COOK PISTON RINGS	SAVINGS
FUEL			▼
Gallons per Hour	158	149	9
Cost per Hour	$15.80	$14.90	$.09
Gallons for 5000 Hours	790,000	745,000	45,000
Cost for 5000 Hours	$79,000	$74,500	$4,500
LUBE OIL			▼
Gallons per Hour	2.04	.98	1.06
Cost per Hour	$1.22	$.59	$.63
Gallons for 5000 Hours	10,200	4,900	5,300
Cost for 5000 Hours	$6,120	$2,940	$3,180
MAINTENANCE			▼
Ring Breakage	Every 400 Hours	None	Greater than the cost of the COOK Rings
Cylinder Lacquer	Considerable	None	
Cylinder Wear	Considerable	Only .003"	
Ring Replacement	Every 400 Hours	Not Necessary	

*** Here is an actual case of how a municipal power plant cut operating costs with Cook "Job-Engineered" piston rings**

Specify COOK "Job-Engineered" Piston Rings for your industrial diesels, compressors, gas and steam engines. There's a right material and style for every service. WRITE TODAY for full information.



Every day COOK "Job-Engineered" Piston Rings are piling up amazing new evidence which no engineer can afford to ignore. In plant after plant they have reduced the biggest expense items in diesel operation and maintenance: (1) Cylinder and ring replacement; (2) High specific fuel consumption; (3) Excessive lube oil consumption.

Take advantage of COOK Job-Engineering Service to assure the proper selection and application of piston rings for your specific engine and operating conditions. It is available anywhere . . . promptly . . . and without obligation.

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DIESEL POWER
AND DIESEL TRANSPORTATION

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July, 1953

Vol. 31, No. 7

Cover Photo: This 1600-hp diesel-electric locomotive, built for export and designed for high-speed service on varying track widths, was exhibited by Alco and GE at the Railway Supply Manufacturers Convention. See page 40 for convention highlights.

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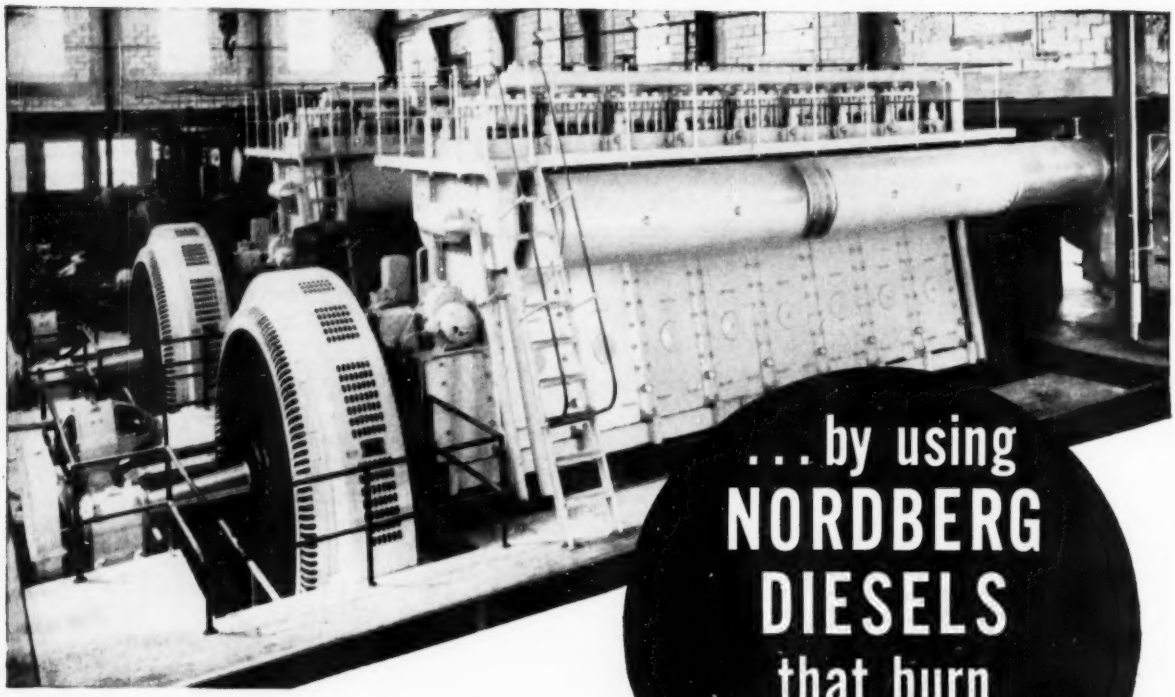
Application for Re-entry at Kutztown, Pa. is pending.

CUT POWER COSTS...



...by using NORDBERG DIESELS that burn Heavy Fuel Oils!

ONE positive way to cut power costs is to use engines that burn more economical Bunker C or residual fuel oils. Nordberg's more than 30 years' experience in the use of heavy fuels is backed by hundreds of thousands of successful engine hours. Nordberg heavy duty two-cycle Diesel engines are built to give maximum operating efficiency at all loads on these cheaper heavier fuel oils.

The installation at Lake Worth, Florida (shown above) typifies the way in which Nordberg Diesels reduce power costs. In this municipal power plant, two Nordberg 3540 hp two-cycle Diesels, operating on heavy fuel oil, have produced an annual saving in fuel cost of over $65,000 . . . another efficient, economical power job well done with Nordberg engines.

In addition to their ability to burn heavy fuel oils, Nordberg Diesels offer many other advantages for municipal and industrial power service, including BUILT-IN DEPENDABILITY . . . PROVED PERFORMANCE . . . ECONOMY OF OPERATION AT ALL LOADS . . . CONTROLLED POWER . . . LOW MAINTENANCE . . . COMPLETE ACCESSIBILITY. Nordberg builds the largest line of heavy duty Diesel engines in America, from 10 to over 10,000 horsepower.

Write for further details, outlining your power requirements.

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DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P753

THE ENGINEER'S REPORT

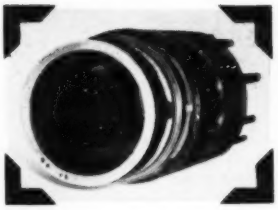
DATA

LUBRICANT RPM Delo Oil R.R.
UNIT Diesel locomotive — 65 to 12 gear ratio
SERVICE Mountain log haul on grades to 3.7%
PERIOD 3½ years
LOCATION Tacoma — Morton, Wash.
FIRM The Milwaukee Road

All liners, pistons still in use after 8800 hours!

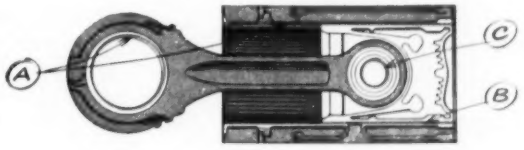
LUBRICATED WITH RPM DELO OIL R.R., engines in the specially low-geared locomotive shown at right required no replacements of bearings, pistons or liners, no major repair work of any kind during 3½ years of hard service—more than 8800 hours of engine operation and 149,859 miles of locomotive travel. Geared at a ratio of 65 to 12, the locomotive hauls up to 134 carloads of logs out of the mountains on upgrades of 2.5%. Going in, upgrades reach 3.7%.

AFTER 48,800 MILES of constant service, this assembly was removed for inspection. It proved the low liner-wear rate: Top bore diameter was 8.5025, bottom 8.501—less than 0.002 out of round!



NO LACQUER DEPOSIT trouble has been encountered in the engines although they idle about 30% of the time, often in low sub-zero temperatures. Rings remain free, as shown in this picture.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

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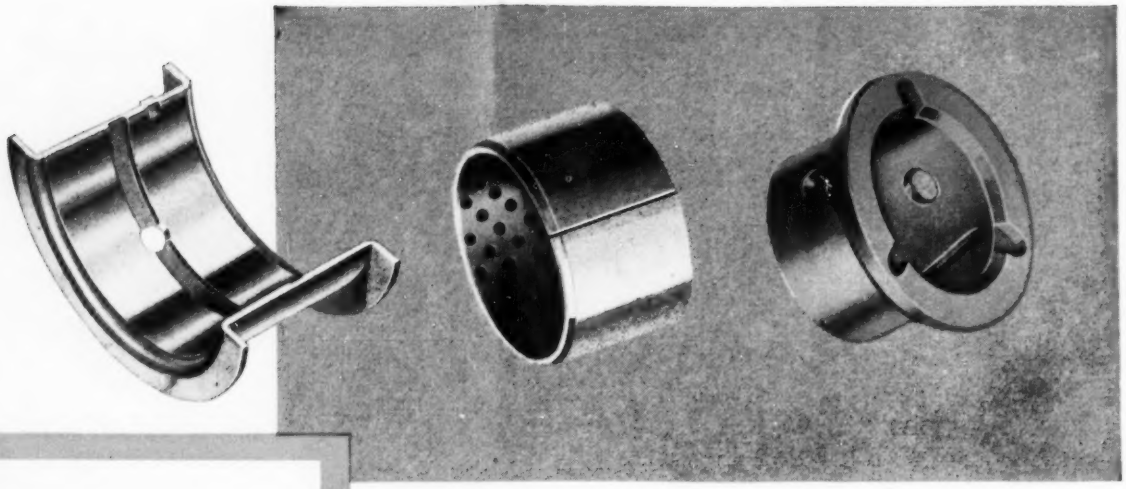
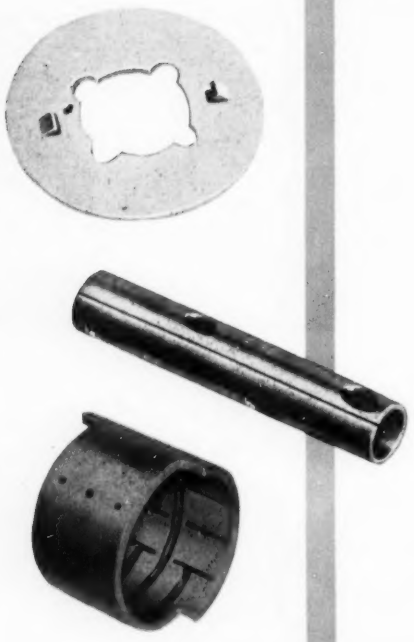
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado





Sleeve bearings in all designs and sizes; cast bronze bushings; rolled split-type bushings; bi-metallic rolled bushings; washers; spacer tubes; precision bronze parts and bronze bars.

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SINCE 1899

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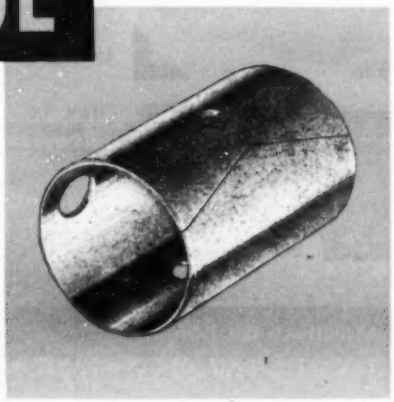

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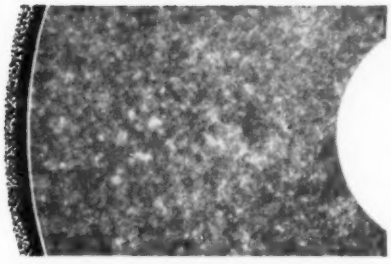
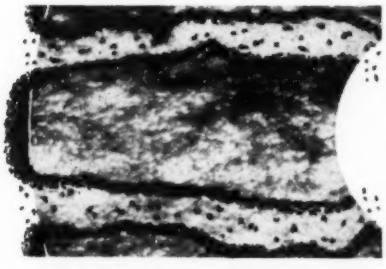
GRADUATED DENSITY

makes MICRO-KLEAN the most effective filter on the market!

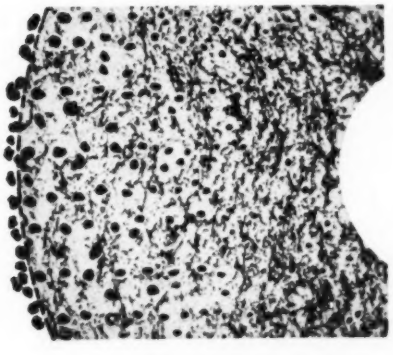
How MICRO-KLEAN compares with other cartridge filters



Compare MICRO-KLEAN with FILTERS WITH THE SAME DENSITY THROUGHOUT. The filter media density is the same on the pressure and discharge surfaces of the element; therefore, dirt accumulation is largely on the outside surface, choking the cartridge ("plastering") and reducing the effective filter life.



Compare MICRO-KLEAN with FILTERS WITH HAPHAZARD DISTRIBUTION OF FILTER MEDIA. Uneven haphazard media density permits fluid to find channels through the filter, and pass solids larger than the minimum filter spacing.



Now Look at the advantages offered by MICRO-KLEAN. See how the fibre density increases toward the discharge side of the MICRO-KLEAN filter cartridge? In effect, every Cuno MICRO-KLEAN cartridge is an infinite multiplicity of screens, ranging from relatively coarse on the outside down to 10 microns in the center. Because of MICRO-KLEAN's graduated density in depth, particles are entrapped within the entire depth of the filter element, giving the cartridge a much longer effective life. Standard cartridge size is 9¾" long by 2¾" O. D., in densities of 10, 25 and 50 microns.

MICRO-KLEAN gives you

- **greater dirt holding capacity**
- **absolute protection against rupturing or channeling of the cartridge**
- **longer effective cartridge life**

REMEMBER . . . IF YOU CAN PUMP IT, CUNO CAN FILTER IT

M.3.C

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

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MICRO-KLEAN's graduated density-in-depth allows greater capacity for dirt accumulation within the micronic cartridge, giving twice the effective life of an ordinary filter cartridge. Thus, cartridge replacement costs are cut in half. And the high porosity of MICRO-KLEAN permits higher flow rates, enabling you to speed up fluid processing.

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MICRO-KLEAN's low pressure drop operation permits full-flow service on gravity, low pressure, or suction lines—with no loss in operating efficiency.

Try a MICRO-KLEAN cartridge in your replaceable-element type filter. Standard sizes fit many types of industrial filters now in use. Special lengths of MICRO-KLEAN cartridges can be supplied for built-in installations. MICRO-KLEAN cartridges also come in a wide range of Cuno housings.

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M.3.1

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Dept. 251-C South Vine Street, Meriden, Conn.

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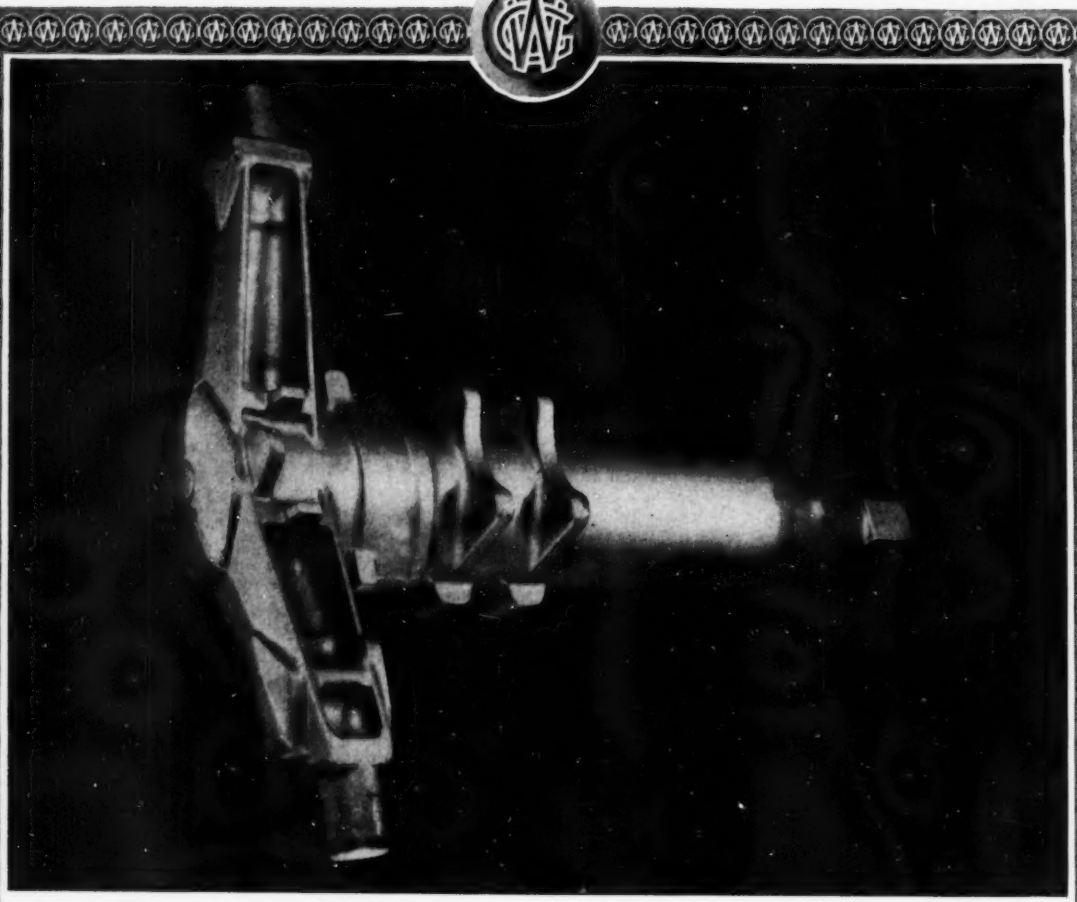

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From a Background of More than 5 Million . . . horsepower of successful Opposed-Piston performance, Fairbanks-Morse now presents the new Model 38F 5¼ Opposed-Piston Diesel. This new engine is ideal in size, power, and compactness for all generating, direct drive and marine applications in the 300-750 horsepower class of service.

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All Opposed-Piston Advantages . . . Plus . . . the many improvements that Fairbanks-Morse engineering has worked into this design. As in the large O-P, this unique principle means an engine with fewer parts to wear, maintain and replace. 2-cycle dependability and economical operation at all loads. Plus the many improvements made—not scaled down parts from larger engine. Be sure you ask your nearby F-M Diesel Specialist about the new Model 38F 5¼ —soon! Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

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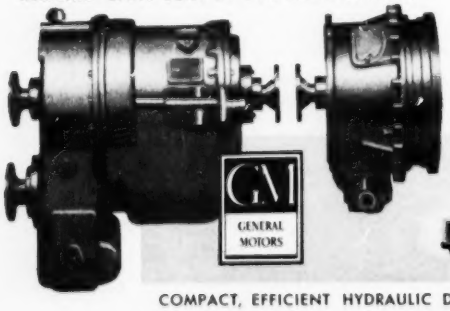
- ✲ *Only* torque converter-transmission team designed to work as a unit and built by one manufacturer.

MATCHED UNITS BUILT BY ONE MANUFACTURER



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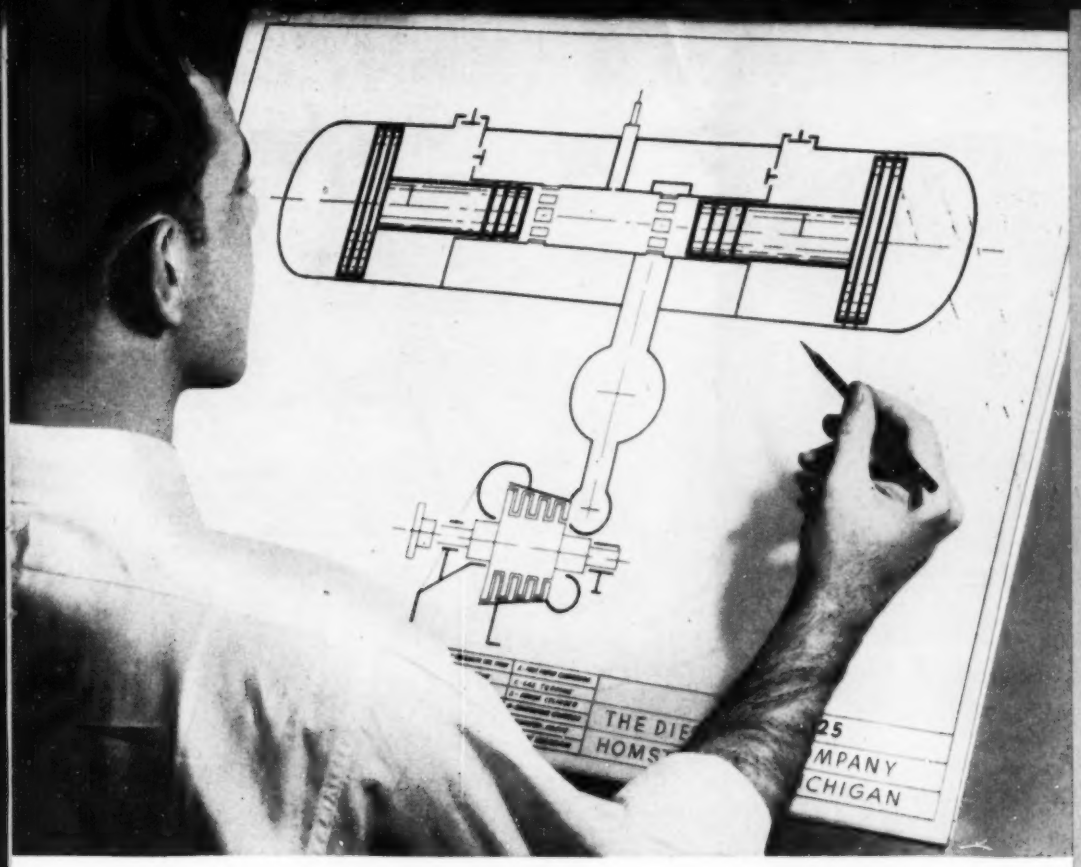

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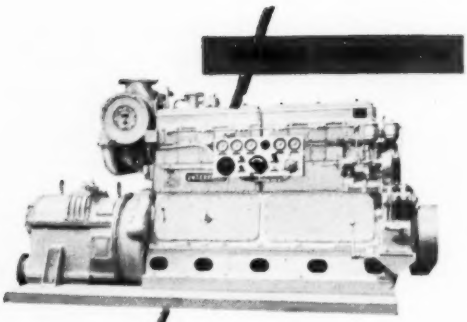
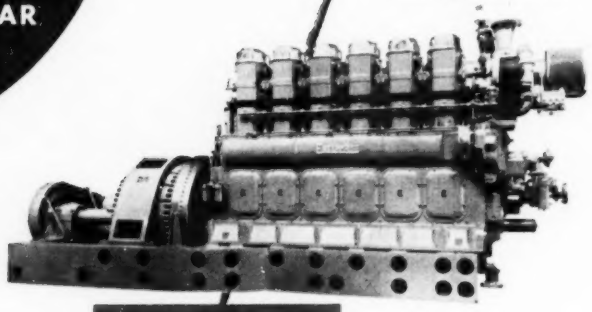
WITH Enterprise

When you line up with Enterprise power you're sure of the finest diesels that money can buy. Advancements in design, precision-construction, and operation, born of 33 years of progressive diesel engineering experience, are reflected through and through in this superior equipment. Select from a broad range of sizes and models to meet your exact requirements: diesel and heavy-fuel burning units; dual-fuel and spark-ignition gas engines; turbocharging available on most models.

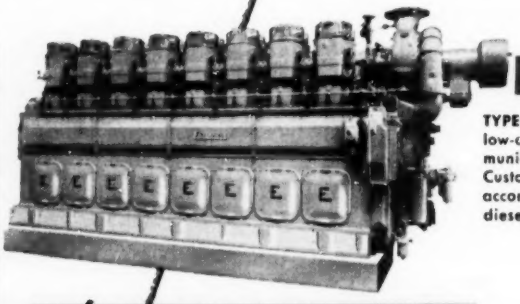
Write today, or get full details from your nearest Enterprise office.



TYPE M ILLUSTRATED. Favored among boat owners for space-saving compactness. Smooth, quiet, highly economical and reliable, 3, 4 and 6 cylinder models from 73 to 609 HP. Other types to 2285 HP.



TYPE G ILLUSTRATED. For continuous or standby heavy-duty electric power generation, types G and Q are unsurpassed in the 273-2285 HP range. These trouble-free engines can be equipped to operate on a dual-fuel, heavy-fuel or spark-ignition basis.



TYPE Q ILLUSTRATED. For profitable, low-cost power in every type of municipal and industrial application. Custom-built bases supplied to accommodate any desired diesel-driven equipment.

ENTERPRISE ENGINE RATINGS			
Model No.	HP*	RPM	Gen. Set KW*
M3	73-162	450-1000	47-108
M4	97-216	450-1000	63-146
M6	146-324	450-1000	98-222
M36	274-609	450-1000	186-424
G6	273-655	250-600	185-456
G36	482-1157	250-600	332-811
G8	364-874	250-600	250-612
G38	643-1542	250-600	445-1084
Q6	647-971	250-375	450-682
Q36	1142-1714	250-375	801-1210
Q8	863-1295	250-375	605-908
Q38	1523-2285	250-375	1068-1624

*Sea Level Rating, maximum

Our thoroughly qualified service engineers are constantly available to supply every phase of service required in your diesel selection installation, operation and maintenance. Well-stocked parts warehouses, stratigically located, are a plus value to Enterprise customers everywhere. In short, you can rely on Enterprise — *The Choice of Power Experts.*

Enterprise
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Diesels

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18th & Florida Streets, San Francisco 10, California
A SUBSIDIARY OF GENERAL METALS CORPORATION

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...with TYCOL lubricants on hand!

Top this record! A well known utility company has operated a turbine for *almost 12 years* without an oil change or cleaning. At a rate of less than 10% "make-up" per year, Tycol Aturbrio has served the plant without malfunction – for years on end. And Tycol Aturbrio performance records show turbine after turbine running well over 100,000 hours without a change! That's *proven stability* . . . further substantiated by the regular use of Aturbrio as an outstanding hydraulic oil. Full data on Aturbrio performance is available from your local Tide Water Associated office.

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

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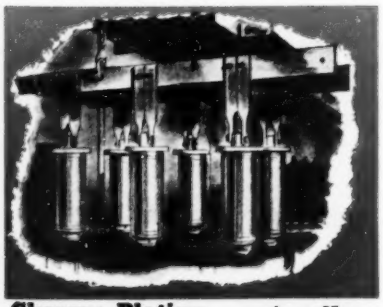
17 BATTERY PLACE - NEW YORK 4, N. Y.

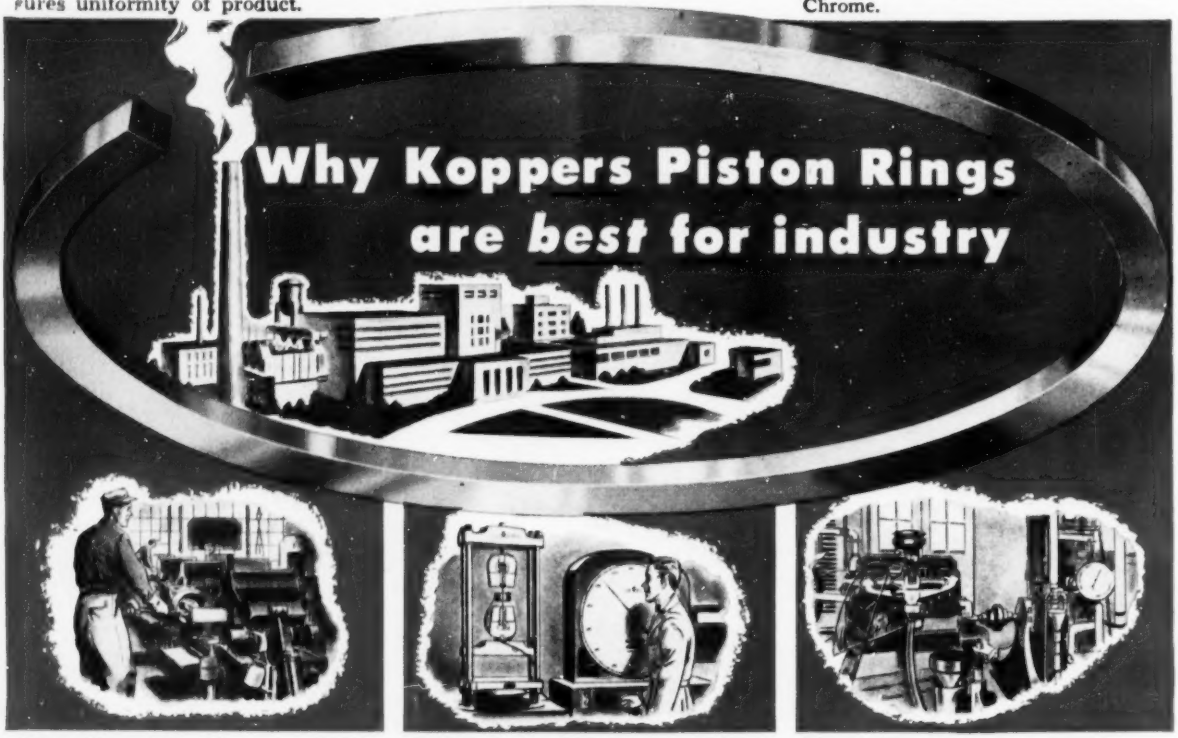
REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

Foundry . . . where top-quality raw materials first assume the shape of piston rings. Strict quality control assures uniformity of product.

Machine Shop . . . where every conceivable size and type of ring is precisely machined to specification.



Chrome Plating . . . where Koppers uses the famous Van der Horst Process to coat rings with Porous Chrome.



Centrifugal Casting . . . an exclusive Koppers process that increases the strength of rings up to 4 times that of ordinary rings.

Engineering & Research . . . where constant testing, checking and experimenting result in better and better piston rings.

Engine Testing . . . where Koppers Rings are tested under far more severe conditions than they will ever be subjected to in ordinary use.

KOPPERS manufactures piston rings in every size, of every type, for every conceivable purpose. Koppers has the solution to every ring problem, whether in gasoline or diesel engines, compressors, hydraulic presses, steam locomotives or any other industrial or aircraft applications.

Koppers engineering, research and manufacturing facilities are responsible for recent important piston ring developments, K-Iron® and Porous Chrome*. K-Iron is a high-grade, closely-controlled material that imparts superior wear properties to piston rings and is surface treated chemically as an anti-scuffing aid.

Koppers Porous Chrome Rings hold and distribute oil during the break-in, quickly wear to best possible seating, *cut cylinder wear up to 50%, last up to 4 times as long as ordinary rings!*

**Van der Horst Process*

Write, wire or phone us for experienced help with your problems. Koppers Company, Inc., Piston Ring Dept., 1547 Hamburg St., Baltimore 3, Md.

KOPPERS ®

Koppers American Hammered Industrial Piston Rings

Only **KOPPERS** *can furnish K-Spun® and Porous Chrome!*

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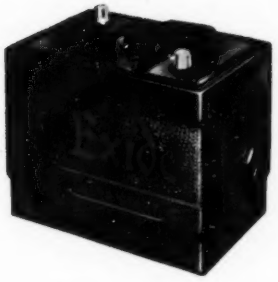
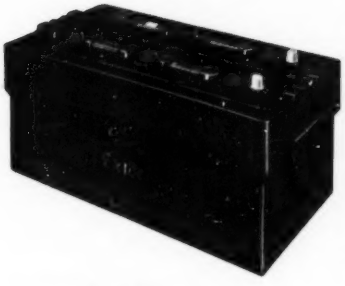
Learn about Exide's new developments—new grid alloys—new active materials—new separators.

They all add up to longer battery life—better performance—lower operating costs. Fill in coupon below and get the whole story. The Electric Storage Battery Co., Phila., Exide Batteries of Canada, Ltd., Toronto.

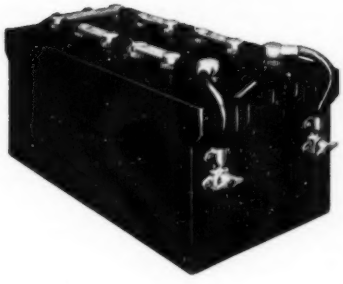
Exide HEAVY DUTY BATTERIES



Group Size	Exide ULTRA START	Plates Per Cell	Capacity at S.A.E. Ratings			Capacity 20-Min. Rate Amperes	Over-all Dimensions in Inches			Net Weight in Pounds
			20-Hr. Rate Amp. Hrs.	300 Amps. at 0° F. Rate Minutes	300 Amps. at 0° F. Rate 5 Sec. Volts		L	W	H	
1	Ultra Start 1	17	115	4.3	4.4	140	9 3/32	7 1/8	8 7/8	46
2L	Ultra Start 2L	19	115	4.3	4.4	140	10 7/16	7 1/8	7 15/16	45
2E	Ultra Start 2E	19	130	5.3	4.5	160	19 5/8	4 1/16	8 7/8	55
2	Ultra Start 2	19	130	5.3	4.5	160	10 5/8	7 1/8	8 7/8	52
2F	Ultra Start 2F	19	130	5.3	4.5	160	10 1/2	7 1/8	9 5/16	54
3	Ultra Start 3	21	145	6.2	4.6	178	11 3/4	7 1/8	8 15/16	59
4	Ultra Start 4	23	160	7.1	4.6	195	12 7/8	7 1/8	8 15/16	65



Group Size	Exide XF	Plates Per Cell	Volts	Capacity Ratings			Over-All Dimensions in Inches			Net Weight in Pounds
				SAE 20 Hr. Rate Amp. Hrs.	1½ Min. at 0° F. Amps.	1½ Min. at 32° F. Amps.	L	W	H	
5D	XF-21	21	6	168	630	818	13 11/16	7 3/16	9 3/8	73
7D	XF-25	25	6	200	755	983	16 1/16	7 1/16	9 1/16	85
9D	XF-41	41	6	336	1260	1638	25 1/2	7 1/2	10 1/8	148
6D	6-XF-21	21	12	168	630	818	20 7/16	9 1/16	9 3/4	139
8D	6-XF-25	25	12	200	755	983	20 5/8	10 1/16	9 1/2	165
—	6-XF-13	13	12	100	378	492	17 11/16	7 3/16	10 1/16	100



Group Size	Exide ULTRA START-LX	Plates Per Cell	Volts	Capacity at S. A. E. Ratings		Capacity 20-Min. Rate Amperes	Over-all Dimensions in Inches			Net Weight in Pounds
				20-Hr. Rate A.H.	4-Hr. Rate A.H.		L	W	H	
3T	Ultra Start-LX 3T	17	6	175	117	170	16 3/8	10 1/16	7 1/2	86
5T	Ultra Start-LX 5T	21	6	220	146	213	20 1/8	9 15/16	7 17/32	109
7T	Ultra Start-LX 7T	25	6	260	175	255	22 11/16	9 15/16	7 1/2	123
1B	Ultra Start-LX 1B	11	12	110	73	107	19 29/32	10 1/16	7 9/16	117
2B	Ultra Start-LX 2B	13	12	130	87	127	20 3/4	10 1/2	8 1/16	130
3B	Ultra Start-LX 3B	15	12	153	102	150	21 3/8	10 1/16	9 13/16	150
4B	Ultra Start-LX 4B	17	12	175	117	170	21 1/4	10	11 3/32	172

"Exide" "Ultra Start" *Reg. T.M. U.S. Pat. Off.*

ACT NOW!

Get the complete specifications, details of construction, the facts on how to lower your battery operating costs.

THE ELECTRIC STORAGE BATTERY COMPANY
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Please send Exide Heavy Duty Batteries Catalog Form 5497C

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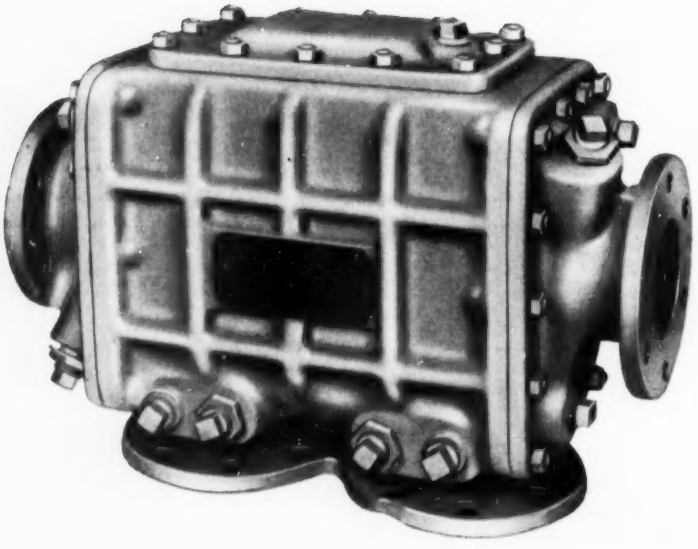
Harrison Heat Exchangers

for dependable duty on Diesels



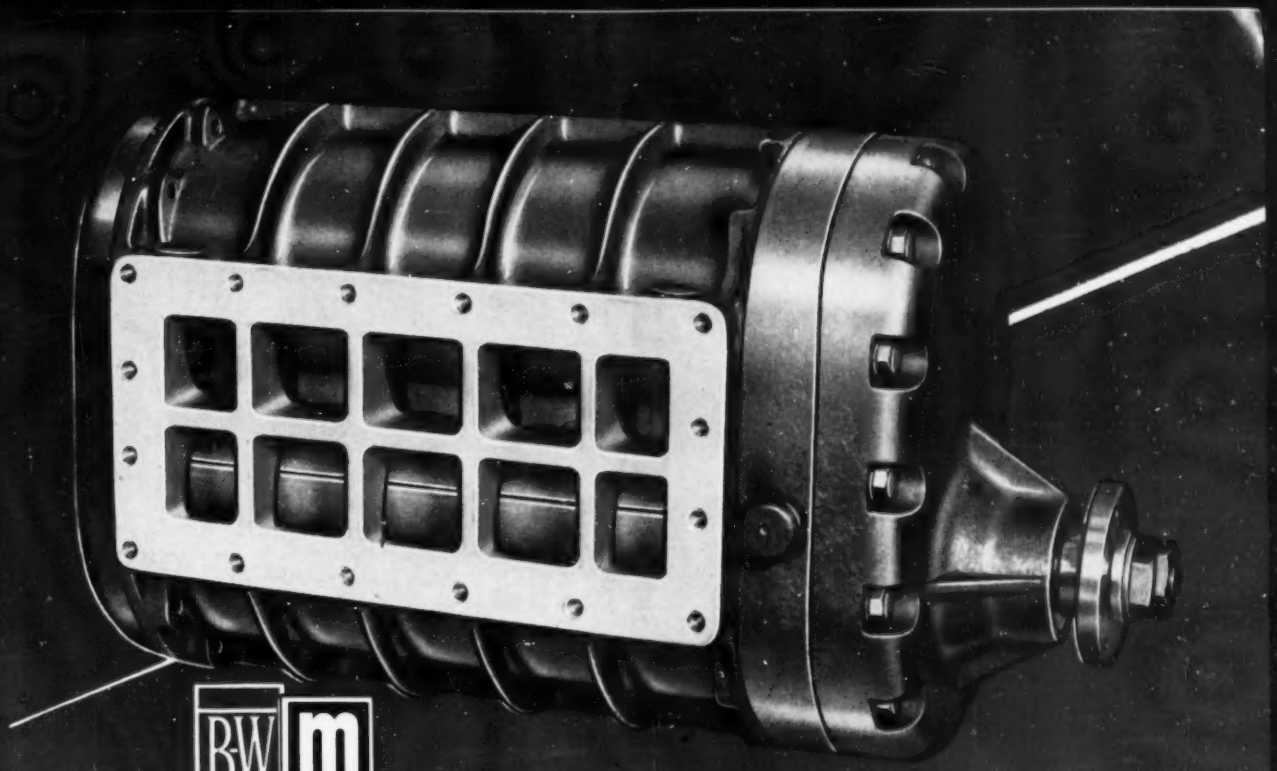
The cooling of lube oil and the cooling of jacket water in Diesel engines is accomplished dependably and economically by Harrison heat exchangers.

This is because *Harrison knows what it is doing* . . . Harrison has been producing heat transfer products that combine high capacity with compactness and durability for forty-two years.

Our engineering experience and our unsurpassed facilities for manufacturing and testing all types of heat exchangers are invaluable to Diesel manufacturers in helping develop units with which to meet their requirements.

HARRISON
RADIATOR DIVISION
GENERAL MOTORS CORPORATION
LOCKPORT, NEW YORK

HARRISON



BW md

A NEW NAME FOR A famous Supercharger

MIEHLE-DEXTER supercharger boosts power, decreases weight-to-horsepower ratio on leading Diesels.

Extra Power to Pull Heavy Loads! Power that means less engine space, less weight per horsepower and more *usable* horsepower. That's supercharging with performance-proved M-D supercharger.

Lab tested for efficiency at Borg-Warner's supercharger laboratory, it's the same supercharger proved for staying power, efficiency and low maintenance service on leading Diesels.

Exclusive Features Improve Performance. The M-D supercharger's exclusive end plate design and tip insert reduce rotor end clearance and improve engine fuel economy. Lightweight 3-lobe rotor cuts vibration and allows high speed safely . . . to improve efficiency.

md

Specify standard M-D models for your applications from 100 to 750 h.p. Or for special requirements consult your M-D engineer.

For more facts write Miehle-Dexter Supercharger Division, Racine, Wisconsin.

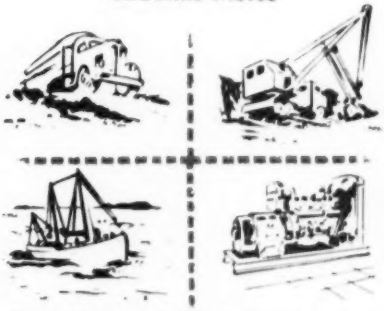
FIELD TESTED ON LEADING DIESELS

The M-D supercharger has won universal acceptance on engines produced by many of the leading Diesel Engine manufacturers, including the following:

Buda Cummins Murphy

Venn-Severin Hercules

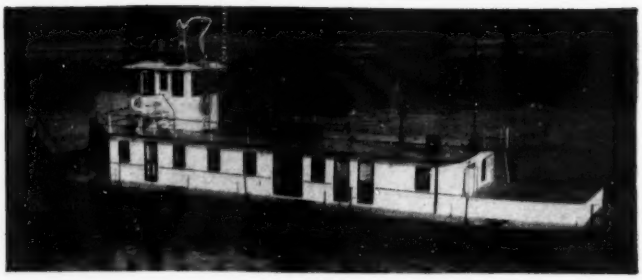
Fairbanks-Morse



The M-D positive displacement supercharger is now engineered and produced by the Miehle-Dexter Supercharger Division of the Dexter Folder Company. The Division maintains complete servicing and repairs for new superchargers and for the thousands now in operation.

MIEHLE-DEXTER SUPERCHARGER DIVISION

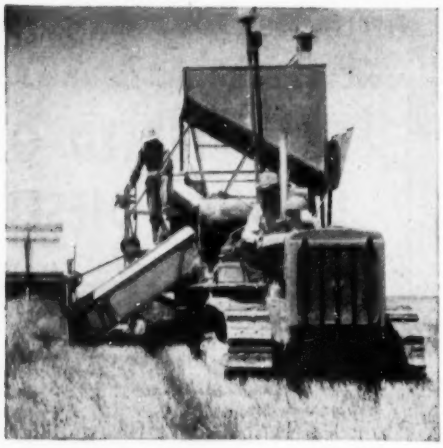
100 FOURTH STREET • RACINE, WISCONSIN



why D-X
can make a

GIANT DIFFERENCE

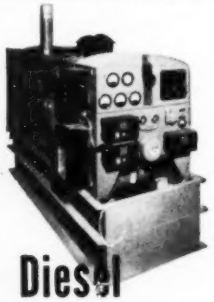
in your diesel maintenance costs



Now D-X Diesel Motor Oils are stepped-up with a new formula of Extrinol, a select group of oil additives specially blended to combat acids, oxidants, sludge, lacquer and other agents of wear that lubrication alone cannot counteract:

This New Extrinol Improvement in D-X Diesel Motor Oils means a "Giant Difference" in your maintenance costs due to D-X's greater resistance to contamination, more toughness for operation under heavy loads, and increased cleansing power.

These are but a few of the reasons it will pay you to investigate new, stepped-up D-X Diesel Motor Oils—D-X DHD, D-X Motor Oil S2, and Diamond T.B.D. They cost no more than other brands and they're sold with an absolute money-back guarantee of satisfaction. If you want more information, and are located in the Midwest, write Mid-Continent Petroleum Corporation, Tulsa, Oklahoma. Or address our office nearest you. No obligation, of course.



D-X Diesel Motor Oils

MID-CONTINENT PETROLEUM CORPORATION
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Waterloo, Ia. Terre Haute, Ind. Omaha, Nebr.
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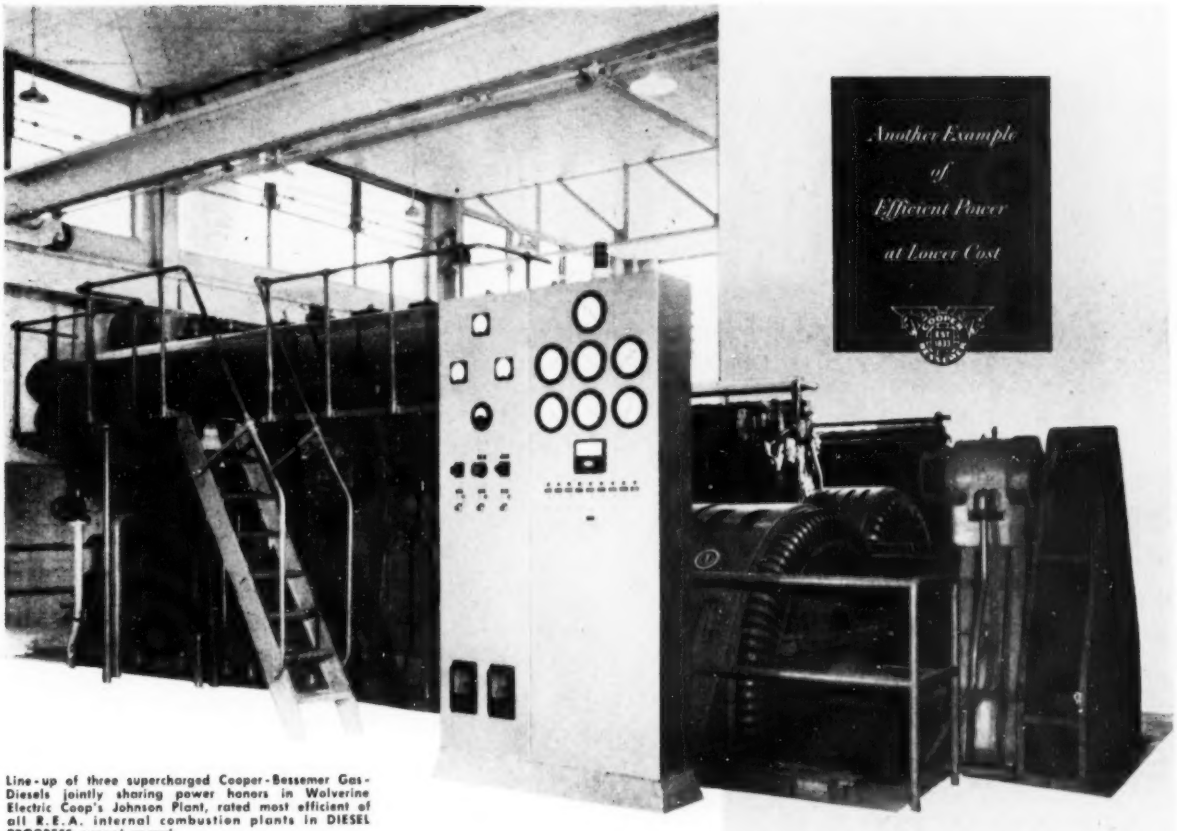


Line-up of three supercharged Cooper-Bessemer Gas-Diesels jointly sharing power honors in Wolverine Electric Coop's Johnson Plant, rated most efficient of all R.E.A. internal combustion plants in DIESEL PROGRESS annual award.

IT'S COOPER-BESSEMER, 4 OUT OF 5

in the nation's most efficient R.E.A. plants!

● Listed opposite, in the order of their standing, are the five R.E.A. plants cited for the highest operating efficiency during 1952.

Needless to say, it is a matter of pride and satisfaction to us that Cooper-Bessemer engines have contributed to the championship performance of the four highest rated plants. This year, credit for powering the top award plant is jointly shared by Cooper-Bessemer. Of the remaining four plants the three next in order are exclusively Cooper-Bessemer powered.

This is the second annual award . . . and the second time Cooper-Bessemer engines have come in for *top* honors. It's mighty strong evidence that you just can't beat Cooper-Bessemers for holding efficiency up and costs down!

★ **WOLVERINE ELECTRIC COOP.**
Johnson Plant, Hersey, Michigan
Net KWH 27,932,458
Adjusted net power cost . . . 6.85 mills per KWH

★ **M & A ELECTRIC POWER COOP.**
Green Forest Plant, Poplar Bluff, Mo.
Net KWH 24,708,960
Adjusted net power cost . . . 7.16 mills per KWH

★ **WESTERN MINNESOTA POWER COOP.**
Benson Plant, Benson, Minn.
Net KWH 13,992,000
Adjusted net power cost . . . 7.20 mills per KWH

★ **THUMB ELECTRIC COOP. OF MICH.**
Huron Plant, Caro, Mich.
Net KWH 11,580,700
Adjusted net power cost . . . 7.71 mills per KWH

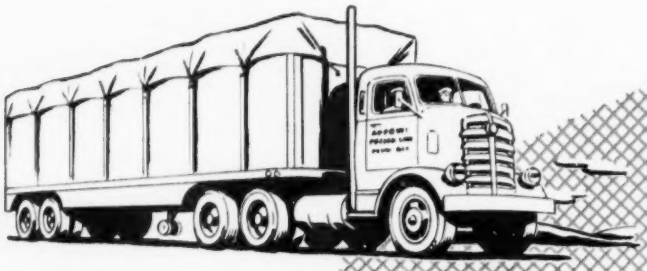
★ **WESTERN FARMERS ELECTRIC COOP.**
Comanche Plant, Woodward, Okla.
Net KWH 13,408,400
Adjusted net power cost . . . 7.75 mills per KWH

★ **Cooper-Bessemer power**

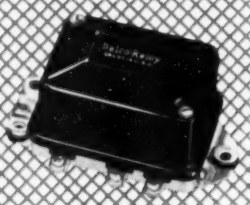
The
Cooper-Bessemer
Corporation
MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D.C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Shreveport St. Louis Los Angeles Chicago Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Tulsa Gloucester, Mass. New Orleans, La.

Right for the Job!



D.C. GENERATOR



REGULATOR

DELCO-REMY HEAVY-DUTY 5⅝" DIAMETER GENERATORS AND MATCHING REGULATORS

Delco-Remy heavy-duty 5⅝" diameter generators have made a name for themselves with Diesel users who need units that develop full output at low speeds on governed Diesel engines. These Delco-Remy generators have exceptionally long brush life (100,000 miles or more is common) and, because of their durable construction and simple, dependable lubrication system, require a minimum of maintenance.

Heavy-duty features include an extra-heavy, rigid armature shaft, extra-large brushes and commutator, ball bearings in both commutator and drive end frames, wick-type lubrication with oilers, and forced ventilation.

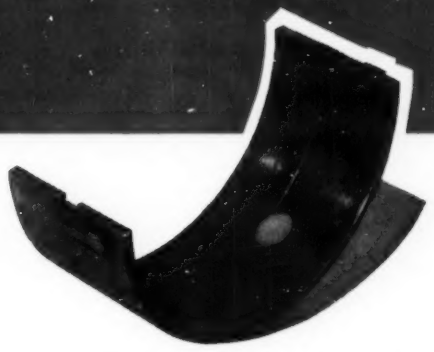
These generators, with a frame diameter of 5⅝ inches, are available in 6-, 12-, 24- and 32-volt models. Six-volt models have capacities as high as 55 amperes, 12-volt models as high as 50 amperes. The 24- and 32-volt models provide outputs of 20 and 15 amperes, respectively. Matching regulators are available for all models. Specify Delco-Remy heavy-duty generators with mounting brackets and pulleys when ordering new vehicles.

DELCO-REMY

Division, General Motors Corporation
Anderson, Indiana

WHEREVER WHEELS TURN OR PROPELLERS SPIN

with Monmouth* "Extraordinary Performance is Routine"



This Monmouth SCLA Main Bearing after 149,000 miles is in perfect condition.

"No bearing failures" in four years and millions of miles of operation reports a large passenger transit company using Monmouth SCLA Bearings. "We only put in new bearings during a general overhaul made necessary by failure of other parts."

Here is another of the many reports of extraordinary performance of Monmouth Bearings which we have on file.

This performance means real economy to the truck and bus fleet operator. This same performance, of course, means satisfaction to the private passenger car owner. For replacement, specify Monmouth Engine Bearings of the type called for by vehicle makers' specifications—distributed exclusively by NAPA Jobbers.

Your NAPA Jobber is a Good Man to Know!

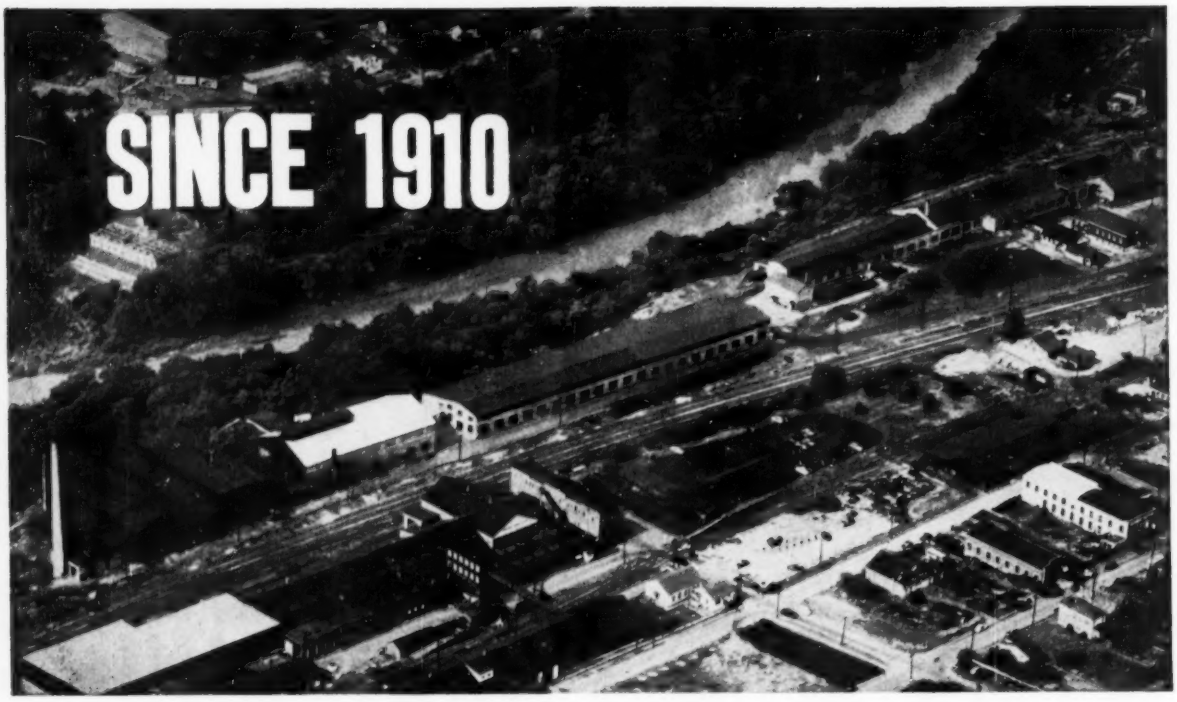
Assurance of Quality

*The words Monmouth, Clevite and Micro are registered trade marks of Clevite Corporation.

Monmouth
TRADE MARK

ENGINE BEARINGS
CLUTCH PLATES AND PARTS
CHASSIS PARTS

Supplied through Clevite Service, Inc. Made by The Cleveland Graphite Bronze Co.
Units of Clevite Corporation, Cleveland, Ohio.



This aerial view of our plant will give you a good idea of our facilities for turning out crankshafts and forgings for diesels.

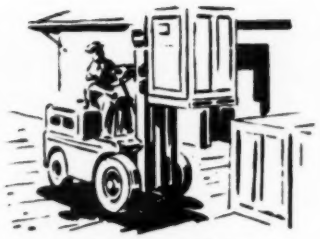
We have been at it since 1910, during which time we have been furnishing a constant and steady supply of crankshafts and forgings for use on diesel engines.

Manufacturers of diesels rely upon Ellwood City Forge for their most exacting requirements. We never disappoint them.

We suggest you write or look in on us for your crankshafts and forgings. We can take care of your needs in a thoroughly satisfactory manner.

Ellwood City Forge Company

ELLWOOD CITY PENNSYLVANIA



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MARINE

Designed to the Special Demands of Industry

HERCULES DIESELS

AUTOMOTIVE

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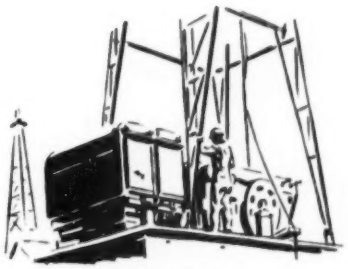


OIL FIELD

CONSTRUCTION

No matter how tough the task . . . you'll find a lightweight, high-speed, heavy-duty HERCULES diesel engine available to do the job, and do it well!

And, when it comes to continuous on-the-job performance . . . low operating cost . . . maximum fuel economy . . . and minimum maintenance . . . you'll agree that HERCULES diesels are a profit-wise choice for dependable power.

For your future diesel power requirements take advantage of the special service Hercules provides industry. That is, a diesel to meet your specifications. No matter what industry—transportation, marine, agriculture, construction—Hercules diesels are designed to the special demands of industry. It will pay you well to discuss diesel power with a Hercules engineer.

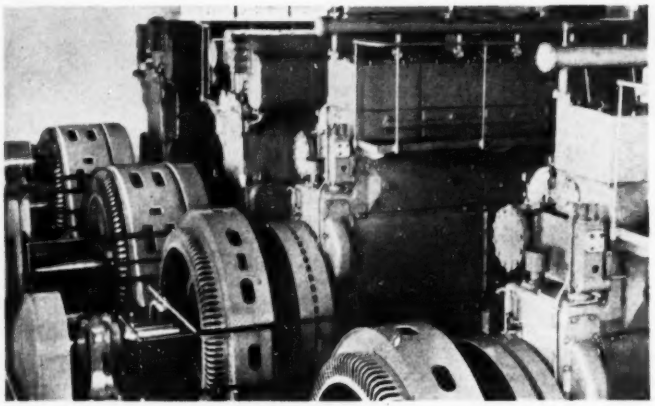
HERCULES DIESEL ENGINES

Model	Bore & Stroke	Displ.
	2 CYLINDER	
DIX2D-83	3⅝" x 4"	83
DIXC	4" x 4½"	113.1
DIXD	4¼" x 4½"	127.5
	4 CYLINDER	
DIX4B	3¼" x 4"	133
DIX4D	3⅜" x 4"	166
DOOB	3¾" x 4½"	198.8
DOOC	4" x 4½"	276.2
DOOD	4¼" x 4½"	255
	6 CYLINDER	
DIX6D	3⅜" x 4"	249
DIX6-272	3-11/16" x 4¼"	272
DJXB	3½" x 4½"	260
DJXC	3¾" x 4½"	298
DJXH	3¾" x 4½"	298
DJXHF	3¾" x 4½"	298
DWXC	4" x 4¾"	358
DWXD	4¼" x 4¾"	404
DWXLD	4¼" x 5"	426
DWXLDF	4¼" x 5"	426
DRXB	4⅜" x 5¼"	474
DRX-501	4½" x 5¼"	501
DRXC	4⅝" x 5¼"	529
DFXB	5" x 6"	707
DFXC	5¼" x 6"	779
DFXD	5½" x 6"	855
DFXE	5⅝" x 6"	895
DFXH	5¾" x 6"	935
DFXHF	5¾" x 6"	935
	8 CYLINDER	
DNX-VBC	6" x 6"	1348
DNX-VBDTS	6¼" x 6"	1468

Engine Manufacturing Specialists Since 1915

HERCULES MOTORS CORPORATION • Canton 2, Ohio, U.S.A.

"12,000 H.P. Hours per Gallon with Sinclair RUBILENE"



... says Leo D. Bradley, Manager
Western Michigan Electric Co-operative, Scottville, Michigan

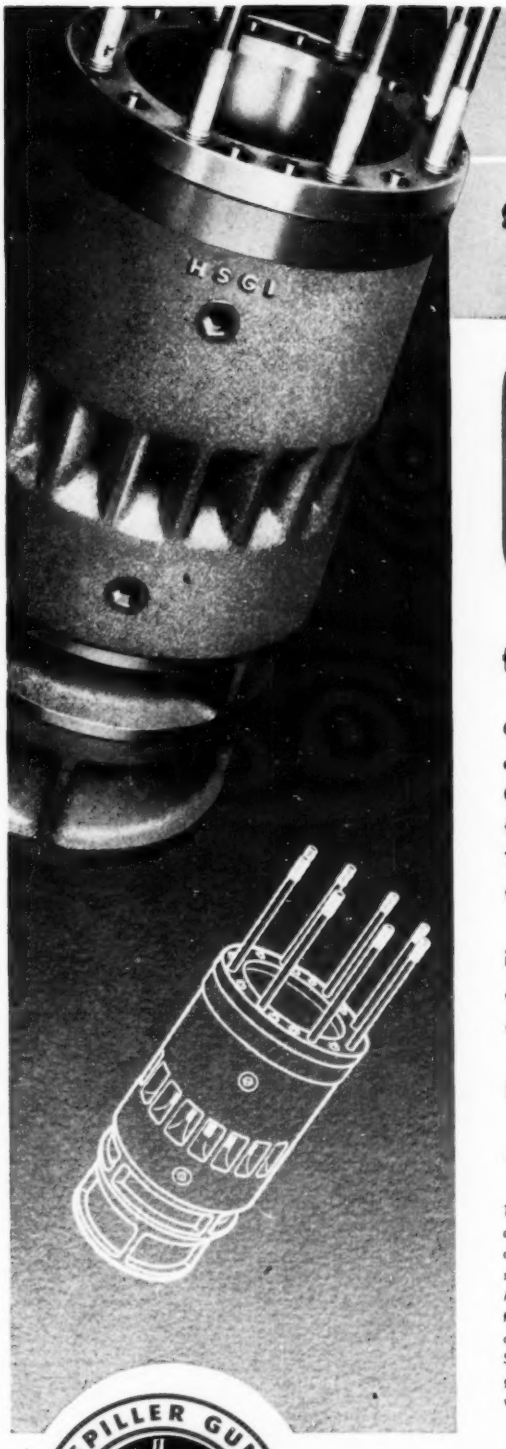
"Our two Cooper Bessemer super-charged 1600 H.P. Model LS8T diesels deliver over 12,000 H.P. Hours per gallon of Sinclair RUBILENE H.D. Oil consumed," says Leo D. Bradley.

"We give much of the credit to the quality of this oil," continues Mr. Bradley. "RUBILENE® keeps our diesels exceptionally clean. Wear is kept at a minimum – the result is high efficiency ... low operating costs ... and low maintenance cost."

Sinclair Products have been used since the generating station first went into operation – 12 years ago. The recommendations made by a Sinclair Lubrication Engineer at that time plus continuous counseling service and superior Sinclair Products have meant substantial savings for this co-operative.

Perhaps a Sinclair Lubrication Engineer can help solve some of your lubrication problems. Phone your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS
prolong engine life



GUN IRON

HUNT-SPILLER

...THE MODERN METAL for Diesel Engine Wearing Parts

Gun Iron castings, identified by the letters "HSGI", spell long, economical service for diesel engine wearing parts. Hunt-Spiller Gun Iron contains properties which provide unusual resistance to friction—extreme pressure—high heat—corrosion and erosion. These properties are recognized as vital for economical operation of diesel engine wearing parts.

The quality of Gun Iron is at all times completely controlled. It is produced in our own furnaces, cast in our modern foundry and, when desired, the castings can be completely machined in our manufacturing plant.

Look for the letters "HSGI" — Hunt-Spiller Gun Iron — for Diesel Engine Wearing Parts.

The Civil War

The term Gun Iron dates to the founding of this company in 1810. During the Civil War at the South Boston Iron Works (opposite) two 11 inch caliber Dahlgren guns were cast, for the revolving turret of the famous Union ship 'Monitor. It will be remembered that the Monitor and the Confederate ship Merrimac were the first ironclads to duel in the Civil War—changing the entire course of naval history. The South Boston works also made some 200 Rodman guns for the Union Army, more than half of which were of 15 inch caliber and weighed 25 tons apiece.

HUNT-SPILLER GUN IRON · SINCE 1810 ·

HUNT • SPILLER

MANUFACTURING CORPORATION

373 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.

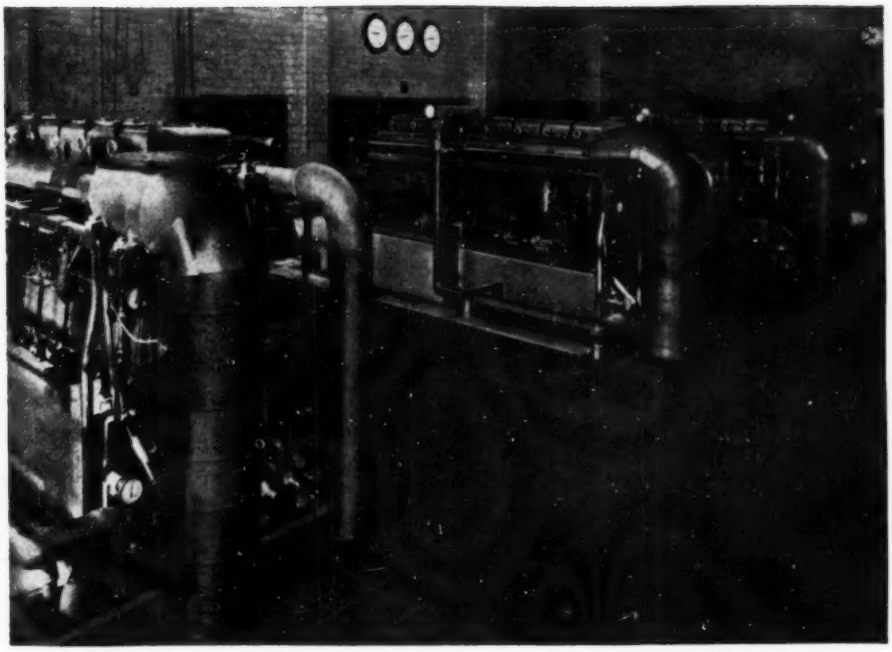
Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.

"Behind-the-Scenes" LIFEGUARD to 12,000 acres of playland

Not many people realize what the Rockaway Pollution Control Project means in the future development of Jamaica Bay as a 12,000 acre swimming, boating and park area. An important role in cleaning up the waters of Jamaica Bay is played by the CP Dual Fuel Engines that generate power for the Rockaway Sewage Treatment Works. These "behind-the-scenes" lifeguards are just one of the many units manufactured by Chicago Pneumatic that afford tops in power performance, low operating cost and rugged dependability. CP diesel, dual fuel and gas engines are available in sizes capable of delivering from 120 hp. to 1750 hp. If your community is faced with purification problems of lake, river, bay or harbor, let Chicago Pneumatic do the same dependable job for you they are doing in this outstanding plant at Rockaway.

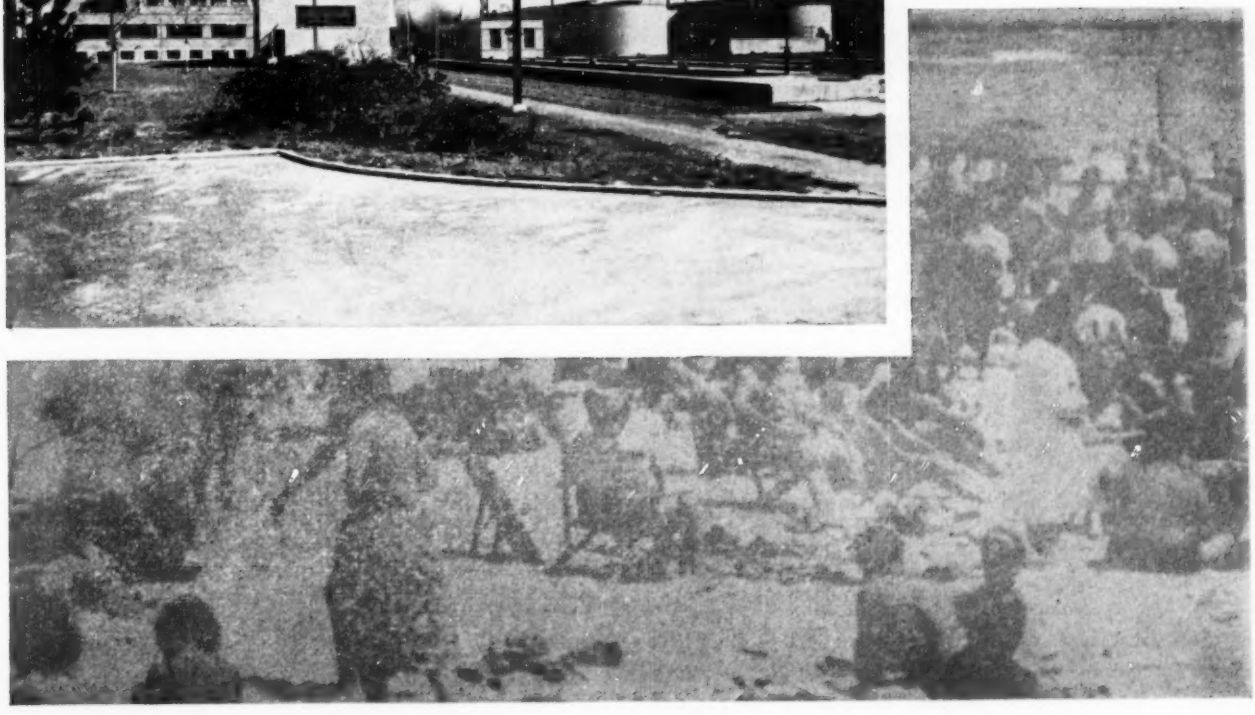
Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

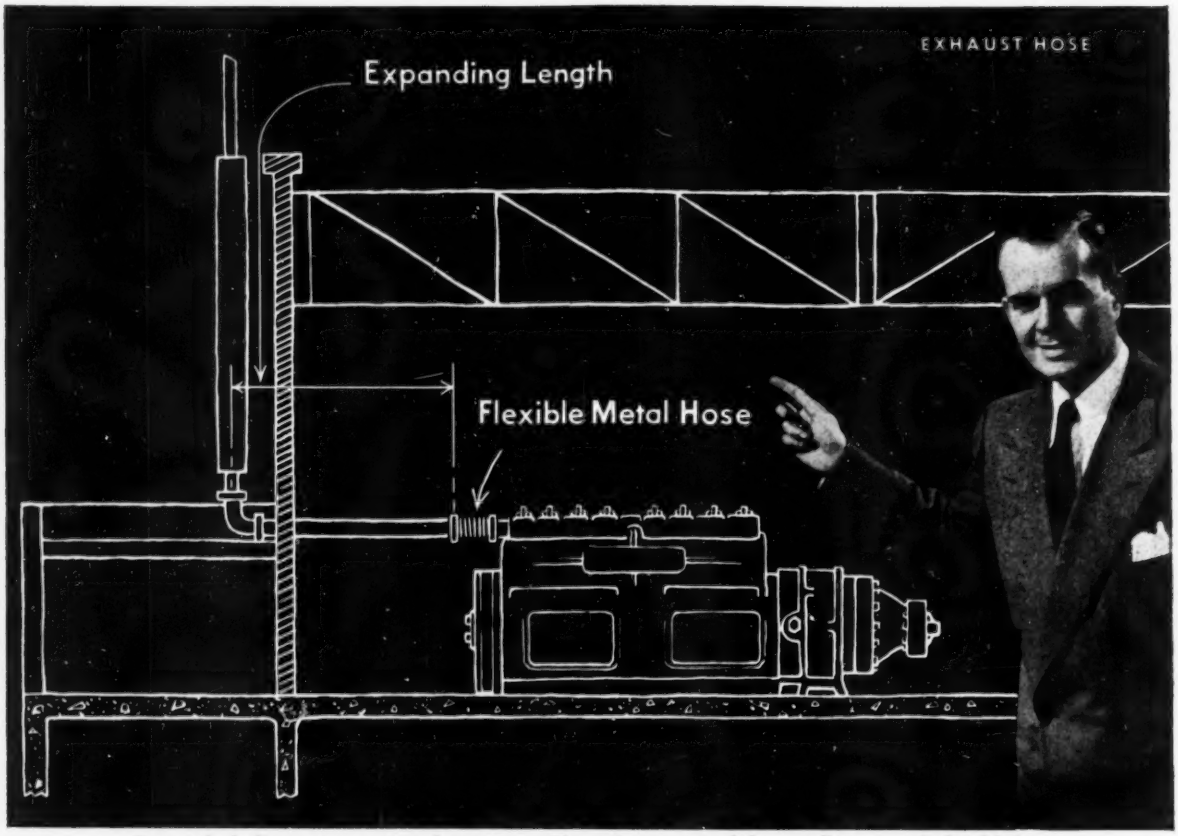
CP
Chicago Pneumatic
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



Three 306 BHP, 600 RPM, Chicago Pneumatic Dual Fuel Engines generating power for Rockaway Sewage Treatment Works.

The New York City Rockaway Sewage Treatment Works.





One method of arranging engine exhaust piping. Thermal expansion of this installation is calculated below.

EXHAUST-LINE EXPANSION:

Here's how to figure it and how to avoid trouble from it

As an example, let's calculate the thermal expansion of 12 ft. of steel exhaust piping. Room temperature is 80°F; exhaust line temperature, 700°F.

From the table at right, find the elongation rates at 80°F and 700°F. Then subtract room temperature rate from exhaust line rate. Multiply this difference by the number of feet and you have your answer: 0.66 in.

A 0.66 in. expansion such as this sets up problems of physical stress, easily solved by the use of American *Flexible* Steel Exhaust Hose. This sturdy hose takes severe expansion in stride. Self-adjusting, it moves with such disturbances . . . prevents bolts from shearing, engine parts from distorting. Flexible metal hose also absorbs engine and exhaust vibration. It offers an easy solution to problems of offset connections and misalignment . . . cuts installation time and effort.

American Flexible Metal Hose for exhaust and air intake—marine or industrial diesels—is available in corrugated steel, 2 in. to 16 in. I.D. inclusive. For full details, write for Bulletin EH-50-1. *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

Thermal Expansion of Exhaust Pipe in inches per 100 feet

TEMPERATURE DEGREES F.	CARBON STEEL	CAST IRON
0	0	0
40	0.29	0.26
80	0.58	0.52
120	0.91	0.80
300	2.37	2.11
400	3.23	2.88
500	4.15	3.72
600	5.10	4.60
700	6.08	5.50
800	7.11	6.46
900	8.17	7.45
1000	9.28	8.49

OTHER PRODUCTS FOR DIESEL USE — *Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze, carbon and stainless steel. Assemblies complete with fittings.*

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

An ANACONDA® Product

COMPLETE *Engine* CONTROL

1436 SERIES
FULL AUTOMATIC CONTROL SETS

Provides full automatic start and stop from any remote pilot switch. Complete safety protection with individual signals. For all gasoline or diesel engines. Ask for Bulletin 401.

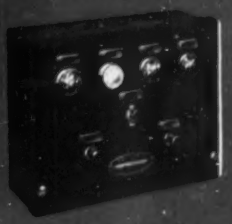
OVERSPEED GOVERNORS

To cause shutdown at any predetermined RPM and prevent damage due to excessive speed. Can be secured in any desired speed range and either manual or automatic reset. Adjustable while the engine is running. For all engines or electric motor drives. Ask for Bulletins 409 and 409A.

SYNCHRO-START *Automatic* CONTROLS

DC SOLENOIDS—
CONTINUOUS DUTY

A small rugged solenoid with a 10-pound pull over a half-inch stroke. Available for 6, 12, 24 or 32 volt DC operation. To operate any mechanism within its pulling range. Ask for Bulletin 410.

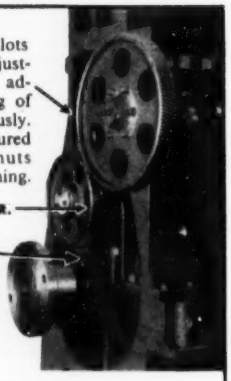


SAFETY ALARM SETS

These controls give an alarm in case of any abnormal condition. Individual signal lights and audible alarm connection. Can be furnished combined with shut down if alarm is not heeded. Ask for Bulletin 407.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE. • SKOKIE, ILLINOIS

ONE OF FOUR WORTHINGTON DIESELS now in the municipal power plant in St. George, Utah. Part of the heat given off by the engines is used to heat a nearby municipal swimming pool by means of a heat exchanger installed in the engine jacket water circuits.



MAIN CAMSHAFT GEAR. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

FREE FLOATING IDLER GEAR.

SPLIT GEAR KEYED ON CRANKSHAFT. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

WORTHINGTON HELICAL STEEL GEAR TRAIN
used on these Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in low fuel consumption and minimum engine maintenance.

Good planning keeps municipal power plant profitable

Eleven years ago, the City of St. George, Utah, started power-plant operations with two Worthington four-cycle, direct injection Diesel engines. Today, the capacity of St. George's plant is 500% greater than it was in 1942—and profits are still being returned to the City of St. George.

St. George planned its power plant to keep pace with increasing power needs and to continue to show profits. That's where Worthington came in. Worthington engineers helped St. George select exactly the right size and type of equipment—engines, circulating water pumps, fuel transfer pumps and air starting equipment.

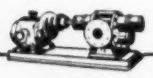
Because of its complete satisfaction with the original Worthington units, St. George purchased a third Worthington Diesel in 1947, a fourth in 1949, and a fifth in 1950. At present a total of four units are in operation, one unit having been replaced by a larger unit in 1950.

Worthington may be able to help save power costs for your community, too. Write your nearest Worthington district office or Worthington Corporation, Engine Division, Section E.3.2, Buffalo, New York.

E.3.2

Worthington-Built Auxiliaries

ENGINE STARTING COMPRESSORS



OIL TRANSFER PUMPS.

COOLING WATER CIRCULATING PUMPS

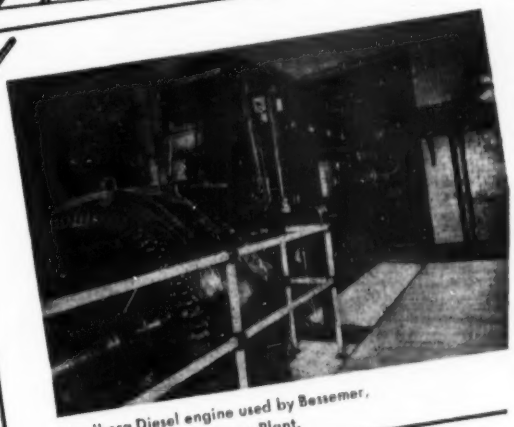
EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 190 to 2,100 bhp.

WORTHINGTON
Engines

*Could you make this report about your diesel engine?**

CITY OF BESSEMER, MICHIGAN REPORTS:



Nordberg Diesel engine used by Bessemer, Michigan Municipal Power Plant.

PISTONS PULLED AT 24,600 HOURS!

- All rings were free
- No carbon in ring grooves
- All original rings replaced in original grooves
- Rings should last at least 10,000 more hours
- Maximum cylinder wear was .004 at top, .002 at bottom

EXCELLENT

OIL CHANGE AT 5000 HOURS!

- No oil added to crankcase between changes
- Power cylinders fed at rate of 5 drops per minute
- Main bearing, rod bearings show very little wear
- Average K.W. per gallon of fuel is 13.5 @ 60% load factor

Sam Kalember

Superintendent,
Bessemer Light Utility.

Note:

FOR TOP ENGINE EFFICIENCY, BESSEMER RELIES ON:

Cities Service DC-930 Oil used for crankcase lubrication!

Cities Service DC-230 Oil used for power cylinder lubrication!

* Why not contact your nearest Cities Service Representative or write Cities Service Oil Company, Dept. G7, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Chrome-Faced Cyclan Ring

high-strength

heat-treated

resilient

long-wearing

Cyclan

offers a combination of advantages not found in any other piston ring material

Sealed Power's new alloy for extreme operating conditions

Developed by Sealed Power metallurgists after years of experimenting and testing, Cyclan has strength approaching steel, resilience and life-expectancy exceeding cast iron, yet it retains the desirable bearing characteristics of cast iron. Cyclan has exceptional ability to retain these unique physical properties under extreme operating heat.

Cyclan piston rings will not break in super-charged engines. Their gaps will not change. They have extraordinarily high impact value for shock resistance. Resilience persists even after considerable distortion.

Available now

Cyclan can be readily chrome plated, but it functions very efficiently without any plating.

Cyclan is available for original equipment piston rings in heavy duty engines. Some Sealed Power Cyclan Ring Sets are available for replacement now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION
MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

Editorially Speaking . . . .

Economics for Embryo Engineers

WE want to talk a bit more about the recent Oil and Gas Power Division, ASME, Conference in Milwaukee. We said last month that it was productive of ideas, and so it was.

It was our privilege to sit in on a DEMA breakfast whereat educators from leading colleges and universities sat down with a group of sales managers from the diesel engine companies. On first thought, you might think that this was an ill-assortment of groups with little in the way of a common meeting ground. However, you would soon have been disabused of that idea.

There was an interchange of information in the course of which the educators outlined their teaching objectives and their laboratory and research facilities. The sales managers in turn, told the educators what they expected in the way of training for engineers in general and particularly sales engineers. In the discussion that ensued, Dr. Martin Elliott, Illinois Institute of Technology, struck the keynote that inspired this dissertation.

Broadly, it was his contention that prospective engineers should be given an indoctrination in economics—economics from the design, manufacture, and sales point of view. He pointed out an almost complete lack of realization on the part of the average student that in industry most engineering was a studied compromise. It is not always possible to design the best possible piece of equipment regardless of cost, but rather to design the best that could be built at a cost that the customer would pay.

To this pronouncement, we say "Amen". We might wish otherwise but this is a cold, calculating economy in which we operate.

We once got a new assistant, right out of engineering school. He was a "fireball". He was critical of designs, installations, and the general way that things were being done. The attitude persisted into the publishing field, and let us assure you we have economic problems too.

Boiling down a year and a half of patient instruction and brushes with reality into a sentence, he left for bigger and better things, chastened and less critical, and *a better engineer!*

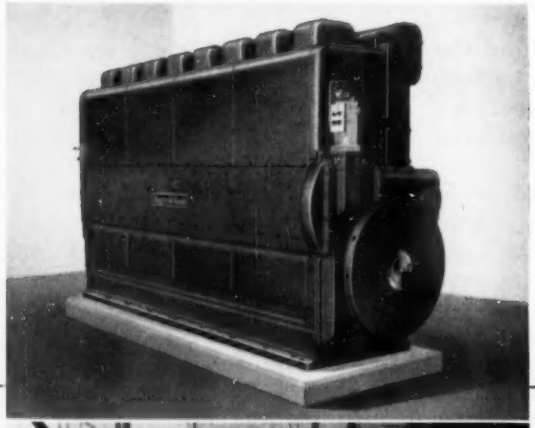
In another case, we were harangued by an enthusiastic researcher who proclaimed that he was getting more than double the normal horsepower out of an engine, and producing each horsepower for some very low number of Btu's. We were impressed until it came out that some ethereal and very expensive fuel was being used. He regarded us as being in the same category as a Mongolian idiot when we suggested that we would not be interested in buying an engine with 100 per cent efficiency if the fuel cost was three times that of conventional fuels.

Perhaps, in this line of thought, we have an answer to why some extremely good theoreticians and technical engineers never rise above a certain point in their careers, while others rise to the top and become V-P's. We suggest that the difference lies in the awareness of cost factors as they affect manufacture and sales, plus the ability to integrate them with sound engineering. In engineering, as in morality or art, it is a question of drawing that certain line somewhere.

Now, perhaps, you will agree with us that it was an inspired thought for DEMA to get the educators and sales managers together.

Heavy-Duty Diesels...

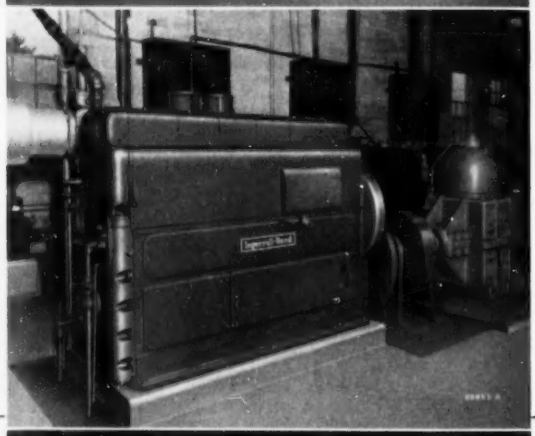
all designed for continuous full-load operation



An 8 cylinder 600 horsepower Ingersoll-Rand Type S Diesel Engine

The I-R type "S" is a 4-cycle, heavy-duty, medium-speed diesel engine with a fuel consumption of only 0.38 lbs per bhp-hr at full load. It has a bore of 10½ inches and a stroke of 12 inches. Speed is 720 rpm for driving 60-cycle generators and 750 rpm for 50-cycle and mechanical drive. It is available with 6, 7, or 8 in-line cylinders and rated at 450, 525 and 600 hp.

The type "SS" is a turbo-charged "S" and provides maximum economy of space and weight by producing more than 50 percent more power than unsupercharged engines. Available in 6, 7, and 8 sizes for 710, 825, and 945 hp.

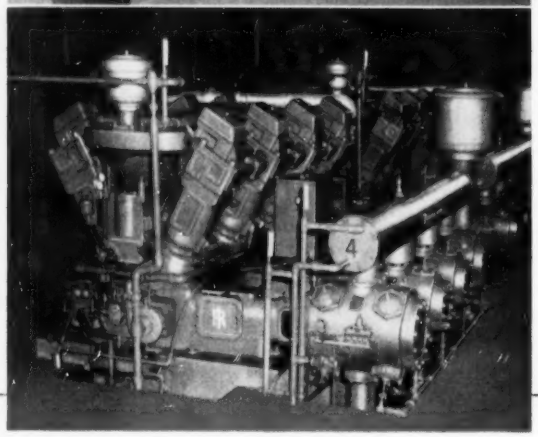


An Ingersoll-Rand 6 cylinder TS Diesel Engine driving an I-R vertical water pump through right-angle gears at a paper mill.

Ingersoll-Rand's new TS diesel engine is a smaller, lighter-weight engine built with all the longlife features, stamina and dependability of big engine design. It is 7 inch bore, 8½ inch stroke diesel with a fuel consumption of only 0.40 lbs per bhp-hr, but weighs about 30 lbs per hp.

Features include: big 5¼" crankshaft, full-floating aluminum-alloy bearings—full pressure lubrication, individual cylinder heads, replaceable liners, removable valve-seat inserts, large single-hole injection nozzles, gear-driven supercharger and many others.

Available with 6 or 8 in-line cylinders and delivering 200 to 375 continuous hp at 900-1000 rpm.



An I-R XVO Diesel-engine-driven air compressor with 8 power cylinders and 4 compressor cylinders on a construction project.

When a Diesel-powered compressor is needed, the Ingersoll-Rand "XVO" is the perfect answer; it combines a heavy-duty 4-cycle diesel engine and a heavy-duty, double-acting compressor in a single, compact machine that's easy to install and relocate. It assures a maximum compressed air output per pound of fuel. With one gallon of fuel oil, the XVO compresses 5600 cu ft of air to 100 lb pressure.

The XVO is available with compressor cylinders for any pressure or vacuum in four sizes with 2, 4, 6, or 8 diesel power cylinders rated at 66 to 280 hp.

Ingersoll-Rand

Starting Air Compressors • Hoists
Impactools • Starting Air Motors

11 BROADWAY, NEW YORK 4, N. Y. 942-7

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES

+ HIGHLIGHTS +

● From Canada, we hear that the Canadian Pacific road expects to buy 358 diesel-electric locomotives during the next five years.

● The first interstate crude oil pipeline was completed in 1888. It carried oil from the Bradford field in Pennsylvania to Bayonne, New Jersey.

● Oil and gas accounted for only 28 per cent of the nation's energy requirements in 1925. Now they account for 57 per cent of the total and are expected to continue this increase.

● New York City has installed 10 mobile diesel generating sets to supply emergency power and lighting in the event of an enemy attack. New York City, however, is not the only city installing diesels in connection with civil defense activities.

● The first successful oil pipeline was laid in 1865. Its length—four miles.

● In the first five months of 1953, Class I railroads installed 1102 new locomotive units. All were diesel except for 8 steam and 1 gas turbine. As of June 1, 1953, Class I railroads had 647 diesel-electric locomotive units on order.

● Reo Motors has initiated a nationwide maintenance program designed to enable the truck user to take himself out of the maintenance business, according to A. L. Struble, vice president in charge of sales. Keystone of Reo's "Polar Plan" is preventive maintenance.

● It takes diesel-powered earthmoving to build roads. Currently under construction is the Air Line Highway which will extend 124 miles between New Orleans and Krotz Springs, La. It will be the longest 4-lane divided toll-free highway in the U. S.

● The 1953 annual meeting of the National Lubricating Grease Institute will be held at the Edgewater Beach Hotel in Chicago, Ill., from October 26 to 28.

● More than 25,000 American communities depend solely on trucks for freight service.

● Among the fully dieselized railroads is the Boston and Albany.

● Last year, the average freight train performed considerably more than double the amount of freight service per hour performed by the average freight train in 1929—the effect of diesel power.

● Railroad officials say they are already saving a half billion dollars a year by switching from steam to diesel-powered locomotives.

● The New York Central Company reportedly scrapped 766 steam locomotives in 1952.

● Emergency diesel standby units are being used extensively in Bell System telephone exchanges to insure continuous telephone service in the event of a commercial power failure.

● During 1952, more than four billion gallons of petroleum products were consumed in tractors alone.

● From present indications, it looks as if the petroleum industry will complete approximately 10,000 miles of pipeline by the end of 1953. PAD estimated lineage at approximately 163,000 miles as of January 1, 1953.

● During 1952, diesels performed nearly 77 per cent of the total yard service as measured in switching locomotive hours, but the cost of diesel fuel consumed was only 48.9 per cent of the total cost of all fuel consumed in that service, according to AAR.

● During 1952, the New York Central road acquired 443 diesel-electric locomotive units. Of this amount, 24 were for the Pittsburgh and Lake Erie road. At the end of 1952, 73 diesel-electric units remained on order and undelivered. When delivered, 60 units will go to the NYC and the remainder to the P&LE.

● A series of high-speed, air-cooled diesels has been added to the engines manufactured by the Swiss Locomotive and Machine Works.

● There are approximately 21,000 diesel-electric locomotives in operation on American railroads.

● The Ninth National Conference on Industrial Hydraulics will be held at the Hotel Sheraton in Chicago with the Illinois Institute of Technology playing host.

● The SAE will hold its International West Coast Meeting from August 17 to 19 at the Georgia Hotel in Vancouver, B.C., Canada.

● During 1952, farmers and ranchers in the U.S. installed some 60,000 stockponds, according to the LeTourneau *Co-Operator*. That represents a lot of diesel horsepower.

● A midwest oil pipeline has been operated by remote control from New York City for almost two years, according to API.

● The world's deepest producing oil well is 17,183-ft deep. It was drilled recently in Louisiana.

● According to API, "the total energy used in farming is about 750 million hp, which is more than used by all other American industries." The percentage of diesel hp in this field is steadily growing.

● American industry is constantly establishing new scholarships and other forms of aid in an effort to meet its demand for engineers and scientists. Illinois Institute of Technology reports: "During the past academic year, 441 students obtained financial help in the form of a scholarship of some kind." More engineers are needed.

● A trailer-mounted Westinghouse gas turbine is currently being tested by the U.S. Army Corps of Engineers to determine its suitability for supplying compressed air.

The Rockaway plant completes the facilities for the restoration of Jamaica Bay (background) as a recreational area.

The Rockaway Sewage Treatment Works

What is being done about the sewage disposal problem in your community? Here is another step in New York City's longrange sewage treatment program. Power for the activated sludge process used is supplied by dual-fuel engines—a logical power source for this type of service.

SEWAGE disposal presents a major problem which confronts every community to some degree. It is a problem requiring definite preventive measures. It must be faced and accepted as a job which must be done, if not currently, in the future if the health of a community is not to be jeopardized.

If raw sewage, consisting of industrial and domestic wastes is continually emptied into local streams, or in the case of New York—harbors and bays—these waters will eventually become polluted. When this happens, fish and plant life are destroyed and recreational waters become a hazard to a community instead of an asset.

Back in 1696, New York built its first sewer which carried liquid sewage from the city to adjacent waters. This was a convenient arrangement and at that time caused little notice since the amount of sewage was small and the body of water large.

By 1900, studies of the growing pollution condition indicated that corrective measures would have to be taken. In 1930, New York City initiated the Department of Sanitation and with it the first city-wide plan to bring pollution under control.

Realizing the need for sewage treatment, New York City started construction on the first plant for this purpose in 1931. A new city charter in 1938 turned sewage disposal over to the Department of Public Works. In 1948, an accelerated program was embarked upon when the city entered an agreement with the Interstate Sanitation Commission to intercept and treat all sewage flowing into recreational waters by the end of 1953. A second phase of the program called for all sewage flowing into the waters surrounding metropolitan New York to be intercepted and treated by the end of 1959. The remaining two projects under the first phase of the program are expected to be placed under contract by the end of this year.

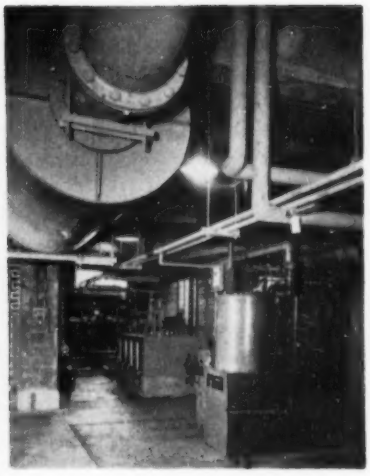
In carrying out its program, the city's Department of Public Works, headed by Commissioner Frederick H. Zurmuhlen, PE, RA, and the Division of Sewage Disposal, with its staff of experts headed by Richard H. Gould, PE, has devoted considerable effort to research. "High-rate" or "modified" activated sludge treatment has been one achievement.

Latest project completed in the program is the Rockaway Sewage Treatment Works. This plant is of the high-rate activated sludge type and, in conjunction with the 26th Ward and two other plants, completes the facilities for the restoration of Jamaica Bay as a recreational area.

Process

There are five basic steps in the sewage treatment process: straining, settling, oxidation, skimming, and sterilization. A sewage plant may be designed to include all or part of these depending upon the needs of the community.

Power is supplied by three Chicago Pneumatic dual-fuel engines, direct connected to GE generators and exciters. Waste heat recovery silencers are to left of the engines.



Lube oil re-refining equipment and tanks are located in one section of the basement

To further illustrate the process, we will follow the sewage flow through the Rockaway plant. Sewage enters the plant from intercepter lines and passes through the screen chamber which strains out coarse materials and floating solids. From this point, sewage flows by gravity to the wet well. Motor-driven pumps then transfer sewage to the grit chamber for the removal of sand and other grit. Grit is washed and stored in hoppers for removal by truck to sanitary fill. This is the first phase of settling.

The next step is oxidation which takes place in the aeration tanks, followed by skimming and final settling tanks. Sludge is pumped from the settling tanks to a sludge concentration tank, while the effluent passes through the final effluent screens and is sterilized in a chlorine contact chamber. Effluent flows from this chamber through an outfall to the bay.

Sludge is pumped from the concentration tanks to the primary digestion tanks where a methane gas is produced during digestion. Sludge is then pumped from the primary to the secondary digestion tanks, and finally to a storage tank for removal by sludge boats.

All of this requires power and heat. Motor-driven pumps throughout the plant must be operated. Blowers driven by 125-hp motors which supply large volumes of air to the aeration tanks must be powered. Plant illumination must be supplied. Heat is required for the propagation of anaerobic action in the digestion tanks. This is where the dual-fuel engine comes in. Aside from furnishing electrical power and, through waste heat recovery, the heat necessary for sludge digestion, the dual-fuel engine can efficiently utilize as fuel the methane gas which is produced as a by-product of the sludge digestion process.

Engines

Power for the Rockaway plant is supplied by three Chicago-Pneumatic type 89 CPDF 4-cycle dual-fuel engines, rated 306.5 hp at 600 rpm. A GE 250-kva generator is direct-connected to each engine. Exciters, too, are direct-connected.

Since methane gas is a product of the sludge digestion process, and is only available when the system is operating, dual-fuel engines are logical prime movers for this type of service. Engines in a dead plant may be started and run on liquid fuel until gas becomes available. In the event of a gas failure or low gas availability due to fluctuating seasonal sewage flow, as is common in Rockaway, a summer resort, engines can be run on liquid fuel to assure continuous plant operation.

Dual-Fuel Arrangement

Purchased fuel oil is stored in two 3000-gal tanks adjacent to the main building. Liquid fuel is transferred from these tanks to two 150-gal day tanks located in the basement of the main building, through a motor-driven transfer pump. A hand-operated transfer pump is also installed in the line from the storage tanks.

From the day tanks, fuel is delivered to the engines by three motor-driven pumps similar in design to the transfer pump. On the engine individual constant-stroke, positive displacement fuel injection pumps mounted adjacent to each cylinder meter the liquid fuel.

Gaseous fuel is obtained from the primary sludge digesters at approximately 4-in water pressure. In passing through the gas metering building, gas pressure is boosted, in positive-displacement rotary compressors, to 20-in water and reaches the engines at approximately 18-in water. Surplus sewage gas is piped to a Hortonsphere for storage. Gas in excess of the amount which can be used for fuel or stored is piped to two waste gas burners atop the gas metering building. Included in the gas fuel system are all the necessary safety devices and controls such as flame traps, pressure regulators, etc. Gas collection and distribution equipment required for a plant of this type are also complete.

Waste Heat Recovery

In this section, we will discuss waste heat recovery as associated with the engine cooling water, lube oil, and

exhaust systems. As mentioned previously, heat is required for digesting sewage and building heat. Heat for the sludge digestion process is furnished by the engine jacket water. Transfer of heat from jacket water to digester water takes place in shell-and-tube type heat exchangers.

Further jacket water cooling is provided by evaporative coolers located in the plant basement adjacent to the heat exchangers. Lubricating oil is cooled by jacket water returning to the engine. Jacket water is circulated by any or all of three 75-gpm motor-driven centrifugal pumps.

Building heat is supplied by waste heat recovery silencers installed in each engine exhaust line on the engine room floor. Each of these heat recovery silencers are capable of evaporating 450 lb of water per hr to 5 psi steam. In addition, two 60-bhp low-pressure type boilers, rigged for gas or oil firing, have been installed to supplement the output of the waste heat boiler-silencers. Heat is supplied to all buildings except the skimming gallery.

Up to the time of this writing, engine cooling water has not been treated. However, de-scaling units are currently being installed.

Lube Oil System

Directly below the engine room floor, adjacent to the free end of each engine, are individual by-pass connected oil purifiers mounted on a concrete base near each engine foundation. During operation, approximately 10 per cent of an engine's lubricating oil continuously passes through its purifier.

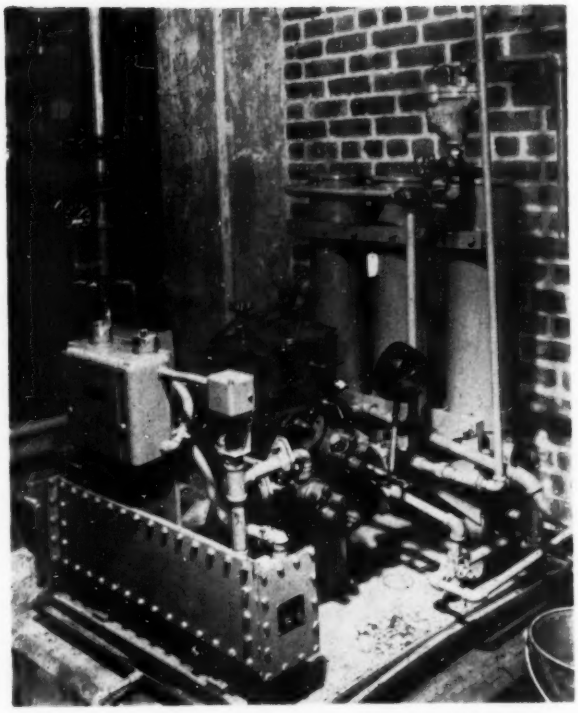
A motor-driven auxiliary lube oil pump is also mounted on a concrete base near each engine foundation. These units permit pressurization of engine lube oil systems prior to starting. After starting, the engine lube oil pump takes over and the auxiliary unit is shut down. Should the engine lube pump fail, the auxiliary unit can be cut in from the control cubicle.

Also included in the lube system are the necessary controls and alarms. In the event of a low-pressure condition, controls automatically shut down the affected engine and actuate audible and visible alarms on the engine control cubicle and engine room wall.

In another section of the plant provisions are made for the batch purification of the lube oil. At this point, a "Puri-Filter" unit is connected. This unit consists of a centrifuge with a heating unit and three cellulose filters of the replaceable-cartridge type. Clean and dirty oil storage tanks are mounted to one side of the centrifuge. Further batch purification of lube oil is handled in a re-refiner mounted near the oil storage tanks.

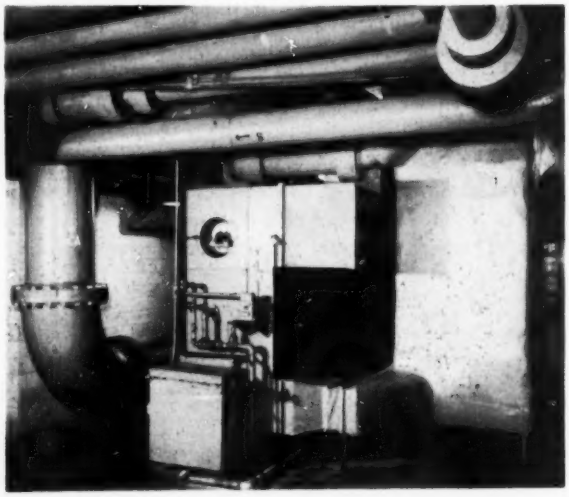
Controls

Individual control cubicles located near each engine on the engine room floor contain remote-reading pyrometers, tachometers, ammeters, and necessary alarm signals. Included in the alarm circuits are: generator circuit breaker, lube oil pressure, water flow, water temperature, and overspeed and journal temperature. The engine lube oil pump, fuel oil service pump, and engine jacket water pump can also be controlled from this point.



Adjacent to the lube oil storage tanks is a centrifuge equipped with a bank of cellulose, replaceable-cartridge type filters, a heater and all necessary controls.

Another section of the plant basement houses two evaporative coolers. These have been installed to cool engine jacket water since final effluent is not bled back and used as a cooling medium as in some other plants.



Should trouble develop, panel lights indicate the cause and audible alarms are sounded. In addition, a red alarm light mounted on top of the cubicle is illuminated, indicating in which engine trouble has developed. Simultaneously, a sign high on the engine room wall lights up, indicating the portion of the plant affected.

Controls for the distribution of electrical power, required throughout the plant are contained in the main control and benchboards. These are housed in a control room adjoining the engine room. Also in the main control room are two motor-generator sets for charging the 60-cell storage battery which provides emergency power for the main switchboard.

One motor-generator is operated on power furnished by the engines while the other is connected to a commercial power tie-in. Purchased power is also available for the operation of the auxiliary lube oil pumps, starting air compressors, and fuel transfer pumps to facilitate dead plant starting.

The 100-amp hr to 1.75-v per cell battery serves as an emergency source of power should both plant and commercial power fail. In this event, battery power would permit main switchboard operation, allowing the influent gates to be closed.

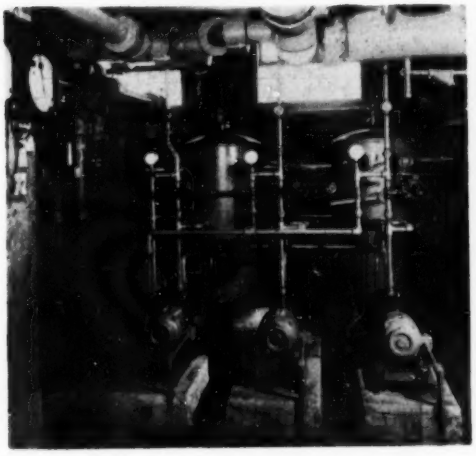
Summarizing

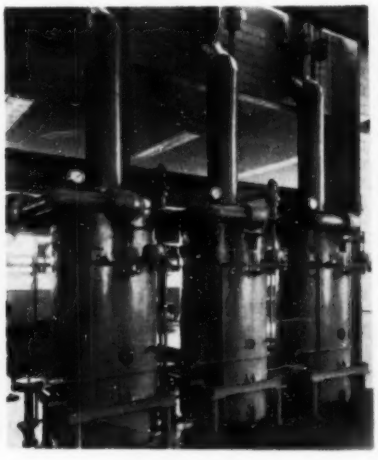
New York's development of the high-rate activated sludge process has proven it to be a system having many advantages. Wherever it may be used, the logical source of power is dual-fuel engines.

Engines of the type have definite economic advantages that cannot be overlooked. On a Btu basis, the overall thermal efficiency that can be realized exceeds 70 per cent. The bulk of the heat input is supplied by the sludge gas, a by-product. Then, when it is considered that, under optimum conditions the total power and heating requirements can be obtained for the cost of the pilot fuel used, the economic advantages are readily apparent.

From the functional point of view, dual-fuel engines provide a reliable source of power with complete flexibility to meet operating conditions. In a dead plant, oil can provide the necessary fuel for starting operations. If, due to seasonal fluctuation, inadequate sludge gas is available, a maximum amount is used with the balance of power requirements being supplied by fuel oil. In this way, fuel bills are minimized and continuity of operation insured.

In a field that is bound to expand, dual-fuel engines have a logical and important role.





At left, are the fuel oil day tanks and fuel supply pumps. In the background are engine to digester water exchangers.

Waste heat recovery silencers—one per engine—are mounted on the engine room floor adjacent to the free end of the engines.

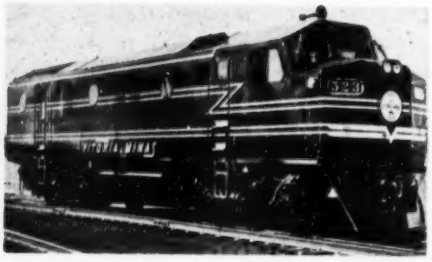
Principal Equipment

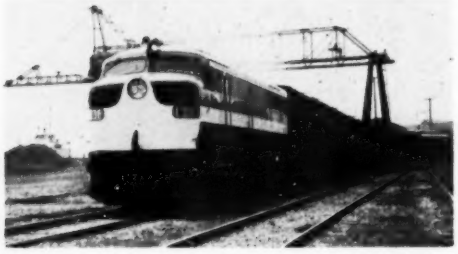
Engines	Chicago Pneumatic Tool Co.
Generators	General Electric Co.
Exciters	General Electric Co.
Governors	Pickering
Blowers	Roots-Connersville
Motors	General Electric Co.
Intake and exhaust silencers	Maxim Silencer Co.
Cooling System	
Heat exchangers	Condenser Service and Engineering
Evaporative cooler	Buffalo Forge Co.
Circulating pumps	American Well Works
De-scalers	Butler Engineering Co.
Lube System	
Pumps	The DeLaval Separator Co.
Oil purifier	Honan-Crane, Inc.
Filters	Cuno, Fram & Briggs
Centrifuge	The Delaval Separator Co.
Coolers	Ross Heater & Mfg. Co.
Refiner	Youngstown-Miller
Storage tanks	Bowser, Inc.
Fuel System	
Gas regulator	Vapor Recovery Systems Co.
Injection equipment	Scintilla Magneto Div., Bendix Aviation
Pumps	The DeLaval Separator Co.
Intake air filters	American Air Filter Co., Inc.
Exhaust waste heat recovery silencers	Maxim Silencer Co.
Instrumentation	
Alarms and shutdowns	Viking Instruments, Inc.
Tachometers	Bristol Co.
Overspeed switch	General Electric Co.
Control and bench boards	Westinghouse Electric Corp.
Pyrometers	Illinois Testing Laboratories, Inc.
Gauges	U. S. Gauge
Thermometers	Taylor
Recording thermometers	Wexler
Fuel storage gauges	The Liquidometer Corp.
Storage batteries	The Electric Storage Battery Co.
Motor-generator charging set	Electric Products

A view of the ACF Talgo train on the trestle between St. Charles and St. Louis, Missouri enroute to the Railway Convention.

GM's Export "B" Model designed by Electro - Motive, shown at the lower left.

The Alco-GE "World Locomotive" for service on either broad or narrow gauge.





Highlighting the Atlantic City Railroad Convention

SOME 2800 to 2900 representatives of railroads and allied services from the United States, Canada, Mexico, South America, and other foreign countries attended the 1953 Quinquennial Convention of the Railway Supply Manufacturers Association. This was held June 22-27, in Atlantic City, N. J. This important assembly of railroad men (mostly official and supervisory personnel) and their suppliers (whose representatives numbered about 3600) attended various meetings and the exhibits.

Annual meeting of AAR's Purchases and Stores Division and the Mechanical Division (including the Electrical Section) took place. Also, there were meetings of the American Short Line Railroad Association. These activities along with committee reports, special papers, and discussions were the order of the day from 9 am to 1 pm, Monday through Friday. Other periods were devoted to viewing exhibits of over 200 railway supply manufacturers.

Railroad Fuels Under Discussion

Although there were informative papers on numerous subjects presented before these meetings, those dealing with fuels, particularly the potentialities of burning heavy fuel in railroad engines, are thought to be of special interest.

Presenting some statistical material, A. W. Hix, general purchasing agent, C & O Railroad, reported to the Purchases and Stores Division of AAR that locomotive diesel fuel oil consumption in 1952 was 2,671,429,925 gallons. This amount was 16.6 per cent greater than in 1951 and five times above that of 1946. Last year, the railroads also used 1,472,609,421 gal of heavy fuel oil (in oil-burning steam locomotives), according to Mr. Hix. This was 26.8 per cent less than in 1951 and this was the second straight year in which the use of heavy fuel oil fell below that of diesel oil.

This report gave point to a special paper presented before the Purchase and Stores group by C. G. A. Rosen, consulting engineer, Caterpillar Tractor Company. He pointed out the enviable position of the railroads to seek and develop the use of heavy or low-grade fuel in their engines because of their vast diesel engine programs.

Mr. Rosen, a pioneer in the development of diesel engines and fuels in this country, said that the use of the heavy fuels would serve three main purposes: reduction in fuel costs; conservation of supplies; and would be a potent emergency factor. He went on to say that the railroads consume over half of the diesel fuel burned today. A reduction of fuel cost by only one per cent gallon would mean a savings of $1,200,000 per year in the case of one railroad.

Then, after discussing the reasons for the low cost and availability of heavy fuels and the likelihood of such a situation continuing, he said: "Some of the railroads have made progress in utilizing fuels of this category in actual service tests. They are proving of sufficient significance that their continuance can be expected."

Outdoor Track Exhibits

The principal diesel locomotive builders exhibited various models. Three builders, Alco-GE, Baldwin-Westinghouse, and Electro-Motive, all exhibited models designed and built for use in other countries where track gauges vary from "meter" to broad gauge of 5½ ft. These models are of lighter weight and lower height for operation through tunnels, over bridges and roadways of other countries. These locomotives are for the most part assembled from the same component parts, such as diesel engines, main generators, traction motors, auxiliaries and accessories, used on domestic locomotives.

Some may be equipped with either 4-wheel, 2-motor trucks or with 6-wheel, 3-motor trucks. Steam generators, dynamic brakes, air brakes, and/or vacuum brake equipment may be secured as modifications. On some the air brake is used on locomotive only but with equipment to operate vacuum brakes on train, all with one valve.

Domestic models were exhibited also. Included was EMD's E-8 high-speed passenger diesel locomotive, not new but the latest of its type, used to haul the NYC "20th Century Limited" and the PRR's "Broadway Limited" between Chicago and the East. Fairbanks-Morse's recently developed "Train Master" was on exhibition. The two units shown were the first two built and represent a total of 4800 hp. Baldwin-Lima-Hamilton exhibited its All Service Model AS-616 which, before the F-M "Train Master," was the heaviest diesel unit with the highest tractive power produced by any builder.

American Car and Foundry Company exhibited the latest version of its "Talgo Train." It is powered by a locomotive built by them, using two 408-hp Hercules diesel engines for traction power. Two smaller units provide auxiliary power. ACF considers that the Talgo has "come of age" with certain improvements resulting from over 375,000 train-miles of rough foreign service (Spain). Two such trains are in daily service between Madrid and the French border. Covering 400 miles of mountainous terrain in eight hours, they beat the crack Sud express by four hours.

Features of the Talgo are: light weight—75 per cent less than standard equipment; guided wheels for smooth rounding of curves and excellent anti-derailment characteristics; and, a lower center of gravity—two feet lower than conventional equipment. ACF means to push sales promotion in this country now.

Another example of the use of diesel engines by the railroads was seen in the two types of refrigerator cars on display. Diesel-electric power units supply refrigeration power reqirements. One model involved three companies —Fruit Growers Express Company, Western Fruit Express Company, and Burlington Refrigerator Express Company —who pioneered in railroad mechanical refrigeration. The companies are associated under one headquarters arrangement in Washington, D.C.

The cars exhibited were equipped with GMC "Frigidaire" diesel-electric units in which a Series 2-71 Detroit Diesel 34-hp engine drives a Delco 20-kw generator. There are 175 mechanically equipped cars at present and 232 additional under construction. Of the cars in service, 164 are "Frigidaire" diesel-electric units and all the new construction will be so powered.

The other type of refrigerator car exhibited was a Santa Fe unit, SFRD 3150. It is equipped with a Trane mechanical refrigeration system and is one of two cars recently built. The power for this installation is furnished by a Hercules 50-hp diesel engine-generator set. This is a joint development of the Trane Company and the Santa Fe. Trane has a test car on the Canadian Pacific Railroad and in addition, 11 cars of the Pacific Fruit Express Company are now being equipped.

The Train Master, powered by a 2400-hp FM Opposed piston engine. The units represent 157,500 lb of tractive effort.

Another exhibit at the Railway Supply Manufacturers Convention was the Baldwin - Lima - Hamilton All Service Model

EMD displayed this high-speed GM passenger locomotive assigned to the Twentieth Century Limited on the Central.

At Convention Hall

It would be impossible to cover all of the various exhibits (there were about 212) in detail. Boiling all of these down to those of interest to mechanical personnel, it is still a formidable list. Perhaps the best solution is to mention

a few spot items that caught the eye as either being something new or indicative of problems of special interest.

Emphasis on the importance of clean engine air was immediately apparent. The Air-Maze Corporation exhibited its air filters specially engineered for the railroads. Of particular interest was the oil-bath air filter which, in addition to being very effective, is self-cleaning. Its performance is backed by thorough tests on locomotives and extensive stationary diesel applications.

In operation, the air is deflected downward by a skirt to where it contacts the oil. Increased air velocity during passage through the oil creates a turbulent scrubbing action and as the direction of the air is reversed at this point, heavier particles are dropped out of the air stream. In traveling upward, the air flows laterally through a diffuser screen and an impingement filter element. The air stream carries some oil with it and this, along with any remaining dirt particles, is left in the screen and filter leaving only clean air to enter the engine. The oil, as it collects, washes down into the sump taking the dirt particles with it.

Servicing normally consists of periodic change-out of the dirty oil at 30- to 90-day intervals, depending upon service conditions. The sump is refilled with the same type oil used in the engine lubricating system. At periods of from six months to a year, the cover and element should be removed for inspection and cleaning if necessary.

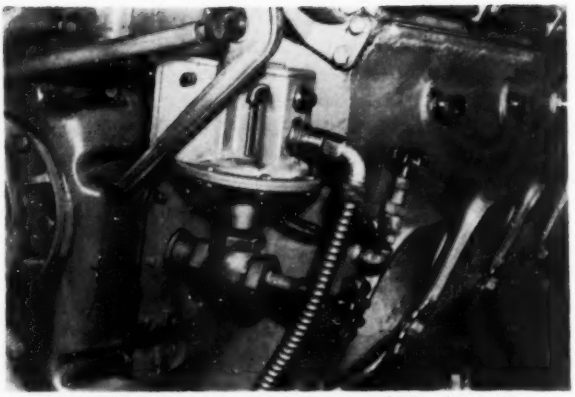
Following up this idea of air cleaning, the Farr Company had on exhibition its new Rotonamic air filter. The company stated that it performs its function without servicing or maintenance. It features a dual cyclonic action that uses centrifugal force to separate the solid particles from the air in a high-velocity air stream.

Incoming air enters each intake tube through deflecting vanes that produce the high-velocity vortex. Dust particles are centrifuged outward in the intake tube and accelerating cone, and are carried by bleed-off air through an annular orifice into the dust discharge hopper. About 10 per cent of the air is used for bleed-off.

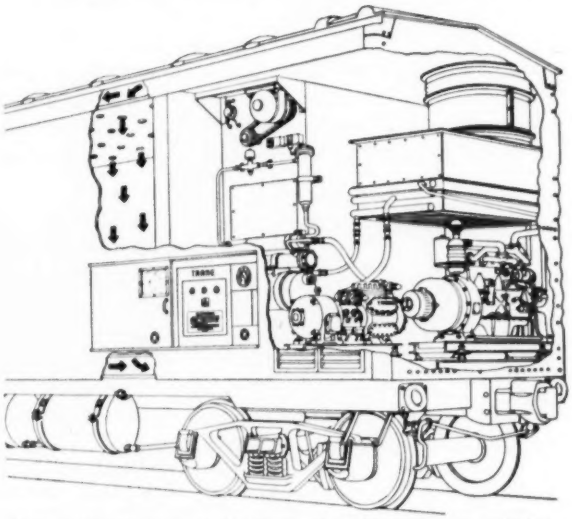
The main air flow, still swirling, reverses direction and travels toward the inlet around the outside of the discharge tube. This produces a second cyclonic action. The clean air then flows through the discharge tube to the engine. Various numbers of these separator units are arranged in parallel to suit the volume of air required. Because of the scouring action of the internal components by the centrifugal dust particles, they are kept clean and the bleed-off action removes the dust as it accumulates.

Jumping from no maintenance to maintenance with a capital "M," Paxton-Mitchell Company exhibited a machine designed to simplify the cleaning and recoating of panel-type air filters. These have always been a headache to clean and when recoiling, to get a consistent and proper job—enough coating to hold the dirt and not too much so that it dirties up the engine space.

Panels are placed in a basket rotating at 250 rpm within a stationary tub. First there is a hot water wash, then a wash with an alkaline detergent such as Oakite 24, Pennsault 34, etc., to clean the panels thoroughly. This is followed by a hot water rinse and in addition to spin-drying, dry compressed air is used to drive off the moisture. Each cycle takes about 30 seconds.



Paxton-Mitchell's detection device which shuts down the engine should excessive crankcase pressures develop.



Schematic diagram of the Santa Fe refrigerator car which is equipped with a Trane mechanical refrigeration system powered by a 50-hp Hercules diesel engine-generator set.

Panels are placed in a similar machine for recoiling. The machine was designed to handle the comparatively new semi-fluid oil such as Calol filter coating. The filter elements are spray-flooded with the relatively heavy coating at a controlled temperature while turning at the 250 rpm. The basket is then spun at higher speed to remove the excess material. The oiling cycle is automatic once set for the particular coating material to be used. Just the right amount of oil is left on the panels without closure of the openings by webbing or without excess being left on the frames.

Incidentally, Paxton-Mitchell also showed an engine protective device for the detection of excess pressure in engine crankcases. Such a condition might be caused by defective pistons, liners, or rings, resulting in blowby. Sensitivity of the units is adjustable down to ½-oz pressure. Whenever excess pressure develops, the protector diaphragm makes an electrical contact energizing the "stop" relay in the governor and shutting down the engine before a more serious condition develops.

Fairbanks-Morse is reported as having adopted this

device as standard equipment on all models. Installations are also being made to existing locomotives on many railroads.

Even atomic energy got into the act. Gamma Industries, Inc., displayed two machines for industrial radiography. This is claimed to be the most effective method on nondestructive testing yet developed. Structural defects in forgings, castings, plate, weldments, etc., as well as dense, opaque materials like ceramcis, refractories, concrete, etc., can be detected. In addition, interior assemblies can be checked for alignment and fit.

The machines derive their energy from isotopes produced and made available by the Atomic Energy Commission. One of these isotopes, Cobalt 60, emits Gamma radiation of 1,300,000 electron volts and can penetrate more than eight inches of steel. Incidentally, the shelf life and working life of these isotopes are identical.

Two machine models are built, one being portable and having a capacity of 300 mc of Cobalt 60 or the radiation equivalent of 465 mg of radium. The larger unit is semiportable and has the radiation capacity equivalent to 7750 mg of radium. It has the ability to take fast exposures required in line production. Both are relatively simple and safe to operate.

Getting back to mundane matters—diesel engines, for instance—it was interesting to see the uses of diesels for other than tractive power in locomotive units. One application was not too far removed, however. In the final analysis, the locomotive unit is a tool for materials handling. The Ready-Power Company exhibited units that carried the principle of diesel-electric locomotive units down to one of the smaller materials handling tools—the fork lift truck. They have a series of diesel-electric power units producing various voltages that permit them to be applied to electrically operated industrial trucks of from 4000-lb capacity up to 20,000-lb capacity, with some ranging higher—up to 40,000-lb capacity.

These units are engineered as self-contained units to fit right on the industrial trucks and take the place of batteries. Hercules diesels, of 26 and 43 hp, power the smaller units while International Harvester Models RD9DX and RD14DX are used in the larger power applications.

Stretching a point, another example of materials handling application involves the installation of a Caterpillar Model D-337 engine with Twin Disc torque converter and reverse gear. One was installed in a 150-ton Industrial Brownhoist wrecking crane on the New Haven Railroad. A counterpart of this engine and power train was exhibited.

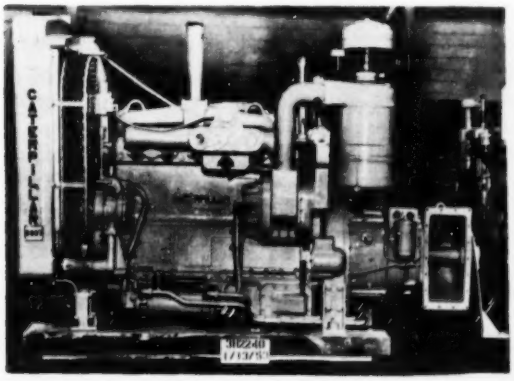
In the conversion job, the diesel replaces the original steam power for much the same reason that the diesel-electric locomotive is replacing the steam locomotive, it is functionally better and much cheaper to operate. If the crane were to be in steady operation for a year, the savings in fuel alone would pay for the conversion.

When one thinks of Caterpillar, one thinks of earth-moving equipment. There is some justification for this and various versions of the equipment are helping the railroads in a number of ways. But Caterpillar is also active in supplying engines for traction power. One example is the Army Transportation Corps' highly versatile 59½ tonner used for switching and light road service. These units, produced by Devenport-Besler, are powered by Cat's 500-hp D397 engine.

And In Conclusion

By now it is pretty obvious that this is not to be a categorical listing and report on the many interesting and informative exhibits. It is more in the order of impressions and lines of thought. To those that we missed, our apologies. Incidentally, other exhibits and products are mentioned elsewhere in this issue.

It was a big show and a constructive one. A final impression gained concerned the vast amount of engineering talent and production facilities that are applied to helping the railroads to do their important job more effectively and more cheaply. This is attested to by the vast number and variety of products as well as services offered to help achieve this objective.



A similar Caterpillar Model D-337 engine with torque converter and reverse gear was used to convert a New York, New Haven, and Hartford locomotive crane.

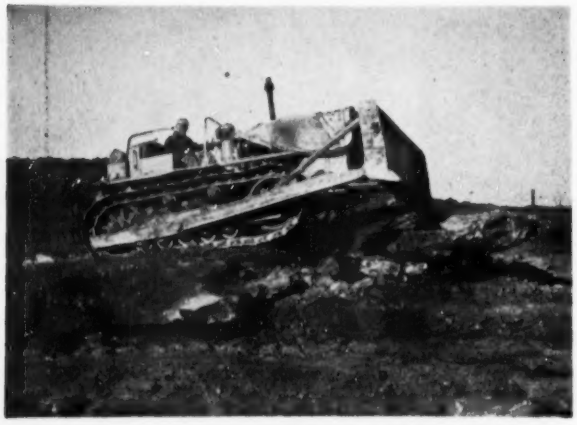
At right, the New Haven's 150-ton rail-mounted Brownhoist wrecking crane, recently converted from steam to diesel power, lifting a railroad car from its trucks.

The Oklahoma City toll gate on the Turner Turnpike, approximately 12 mi northeast of Oklahoma's Capitol.

The Turner Turnpike

More and better highways are needed. Another step in this direction is the recently completed Turner Turnpike — 88 miles of throughway connecting Oklahoma City and Tulsa.

Mile 44, a D-7 dozer engaged in preliminary roadway grading.



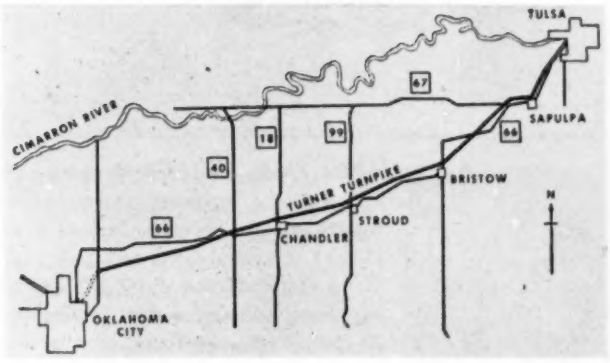
COMPLETION of Oklahoma's Turner Turnpike adds a much needed 88 miles of modern throughway to our nation's over-crowded roads. The new "Pike" is the first road of its kind to go into operation in any state between the Appalachian and Rocky Mountains. It may well be the cornerstone for an integrated system of turnpikes linking the East with the West.

Construction of the turnpike, a $38 million undertaking, was started in late December of 1950 when an army of men and diesel-powered earthmoving equipment invaded the right-of-way. More than 1000 acres of right-of-way were cleared. Excavation amounted to approximately 17 million cu yd. All this adds up to a sizable figure when expressed in diesel hp hr.

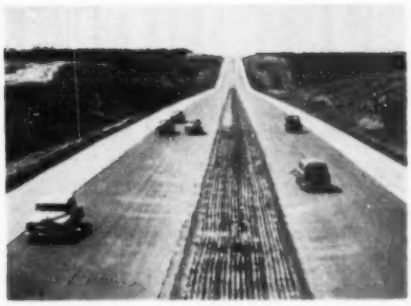
The turnpike has two 24-ft roadways separated by a 15-ft landscaped center mall. Stabilized and bituminous shoulders, 12-ft wide, flank each roadway. The width of the roadway is 87 ft, with the right-of-way being 200 ft minimum and 400 ft maximum.

Paving consists of asphaltic concrete of which approximately 2½ million cu yd were required. The paving is designed for a 28,000-lb axle load as compared to the 18,000-lb maximum axle load design used on Oklahoma state highways. The paved shoulder allows disabled vehicles to be serviced without interrupting the flow of traffic.

In addition, limited access bypasses have been constructed in Tulsa and Oklahoma City to facilitate the movement of transcontinental traffic. These bypasses, along with the turnpike proper, provide 102 mi of continuous 4-lane divided highway from East of Tulsa to West of Oklahoma City.



The new "Pike" chops 14 miles off U. S. Highway 66.



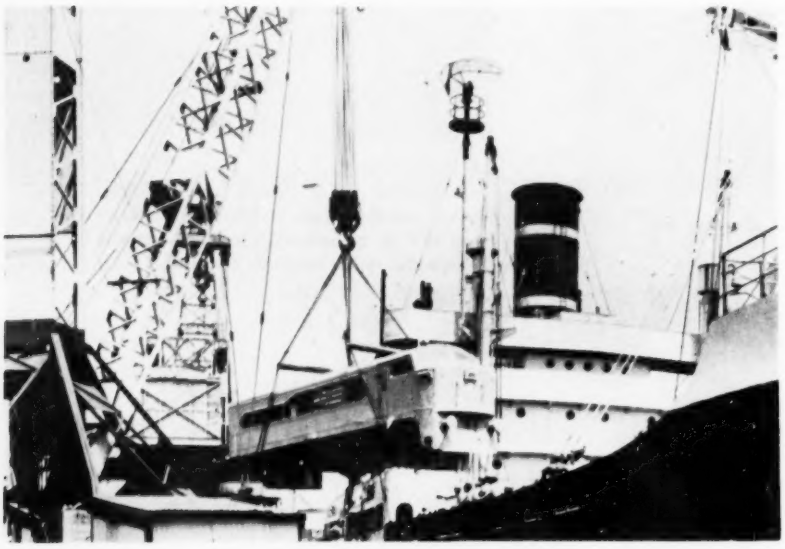
A view of the Turner Turnpike at approximately mile 28 in Lincoln County, Oklahoma. Right-of-way is 200 ft minimum and 400 ft maximum. The width of the Turner Turnpike roadbed is about 87 ft.

Mile 11 (above) a loaded carryall begins a run, while the TD-24 "pusher" backs off to get in position for the next unit.

A little further up on mile 11 (upper right) the cutting is tougher and two "pushers" are needed to load a single carryall.

At mile 50 (right) roadway grading of the new turnpike.

DIESEL BRIEFS



First of 50 Locomotives

Initial shipment of a $15 million order for 50 diesel-electric locomotives and spare parts being loaded at Philadelphia for delivery to the Argentine Government Railways. The locomotives, each one weighing about 230,000 lb. and designed to deliver a starting tractive effort of about 57,000 lb. at 25 per cent adhesion, are Baldwin-Westinghouse units. They are of the 0-6-6-0 type, built for a track gauge of 5½ ft. All six axles are motorized.

Argentina has been a customer of Baldwin for the past 84 years. The first Baldwin locomotive to go into service in that country was built in 1869 for the Western Railway of Buenos Aires.

Since then, more than 500 Baldwin locomotives of steam, electric, and diesel-electric types have served the railroads of Argentina.

C.A.V. To Vend Roosa-Master

The Hartford Machine Screw Co. of Hartford, Conn. has announced the signing of a licensing agreement with C.A.V., Ltd. of London, England to manufacture and sell its Roosa-Master fuel injection pump overseas.

The pump is a single cyl, opposed plunger, inlet-metering type and was presented to the industry at the annual convention of the Society of Automotive Engineers in January. It is available for 4-, 6-, or 8-cyl engines and lends itself to application on 2- or 3-cyl engines as well. The pump can use either the existing engine governor or its own built-in centrifugal or automotive governor.

New Lincoln Rebuilding Plan

Straight line mass production techniques and economies are being applied by the Lincoln Electric Co. of Cleveland, Ohio to the reconditioning and rebuilding of arc welding equipment. The techniques are employed in a new operating division, called the Linc-conditioning Div., which utilizes conveyor lines and line operations to realize efficiencies above work which is normally done on a one-at-a-time basis.

The new division will rebuild, for Lincoln equipment users, engine-driven generators and AC welders. New machine guarantees are placed on all reconditioned welders and cost is said to be half of new equipment.

ARBA Plans National Meeting

A national highway conference of county officials, under the sponsorship of the County and Local Roads Div. of the American Road Builders' Assn., has been announced for September 24-25 in Wisconsin. Tentative program plans include three panels: construction, maintenance, and road administration.

Western Electronic Convention

August 19th opens the ninth annual Western Electronic Show and Convention at San Francisco, for a 3-day run. Electronic manufacturers will occupy 327 booths to display their products and 25 separate technical sessions will be held. Trade and engineering attendance is expected to reach 14,000 although the general public will not be admitted.

Caterpillar Plans New Plant

Plans for construction of a new plant, location not yet determined, have been announced by the Caterpillar Tractor Co. The new plant will be devoted to production of motor graders and industrial wheel tractors and will enable the Peoria plant to accommodate a broadened program of crawler tractor and diesel engine manufacture. The rearrangement of manufacturing facilities and construction is expected to be completed by the end of 1955.

Automation Show Coach on Tour

Automation, a current industrial concern, has been put on wheels by the Westinghouse Electric Corp., and is being taken directly to personnel in the machinery manufacturing industry throughout the United States.

Westinghouse takes the display coach directly to the customer's plant where informal presentations are given, many animated to simulate factory conditions. The coach started its tour in the mid-western sector. It is expected to make some 350 plant visits over a period of 14 months.

DIESEL BRIEFS

CPR Orders Diesel Tank Cars

Sixty-five giant fuel tank cars of 16,000-gal capacity, "among the largest ever built", has been ordered by the Canadian Pacific Railway from the American Car and Foundry Co. for use in British Columbia. Railway vice president N. R. Crump said the cars would be delivered this fall coinciding with dieselization of the Kettle Valley and Kootenay divisions.

The CPR now operates more than 325 diesel locomotives, including 180 on the road and 149 in yard switching service. The 32-ton cars will carry fuel for the railway's western diesel service mainly from prairie refineries.

Petter Diesel Moves

The Petter Diesel Engine Div. of Brush Aboe, Inc. announces that it has moved into larger premises at Woodside, L. I. The move was said to have been prompted by a decision to take over distributorship of products in six of the eastern states. A much larger stock of engine and spare parts will be carried which will be available, in emergency, to all distributors of Petter engines in the United States. The stock will also care for the needs of local dealers which Brush Aboe is in process of establishing.

LMOA 1953 Annual Meeting

The Locomotive Maintenance Officers' Association plans to hold its 1953 Annual meeting, September 14-16, at the Hotel Sherman in Chicago, Ill.

The official program has not been announced, but among the topics set for discussion are the following: diesel-electrical — "Flashovers: Rewiring Diesel Locomotives"; diesel mechanical—"Diesel Engine Lubrication Maintenance Problems"; shop planning —"Scheduling and Flow of Work in Centralized Diesel Shop"; diesel material reconditioning and control—"Economical Reclamation of Diesel Locomotive Parts"; shop practices—"Inspection and Maintenance of Diesel Wheels, Axles and Roller Bearings"; diesel personnel training—"Methods Used to Train Personnel for Maintaining Diesel Locomotives".

Mobile Power Unit

A truck-mounted diesel generator set, operated by GM's Detroit Deisel Engine Div., is currently traveling the country demonstrating the operation of automatic standby power.

In cooperation with the division's distributors and dealers, these demonstrations are arranged for architects, builders, city officials, hospital superintendents, and others interested in maintaining vital services in institutions where temporary suspension of main line power could have serious consequences.

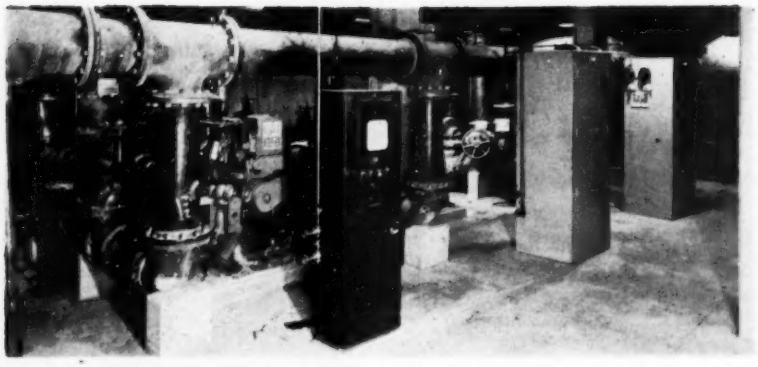
The equipment consists of a 100-kw standby generator, a 6-cyl GM diesel engine, switches, and automatic controls, all arranged on the truck for convenient observation. Demonstration procedure calls for a wiring hookup, routing the building's main line power through the unit's control box. A switch is then pulled to simulate a temporary power failure. When this is done, automatic controls start the diesel and put it on the line. When the normal power supply is restored, the standby set automatically shuts down.

Diesel Autos in Norway

New automobiles, powered with diesel engines, attracted attention at an auto show in Norway. Because of the high gasoline tax existing in that country, experts said the diesels would save large amounts of money for taxi drivers and others traveling many miles each year.

New Nordberg Distributor

Appointment of Gochenaur Marine Co., Philadelphia, Pa., as distributor in eastern Pennsylvania, southern New Jersey, and Delaware, for its 4FS diesel engines, has been announced by the Nordberg Mfg. Co. The appointment marks the company's entrance into the industrial engine field where it will serve industrial plants, contractors, aggregate producers, truck farmers, and others.



At Chicago's Midway Airport, a Synchro-Start Universal Engine Controller is used in connection with GM diesels to provide instantaneous fire protection.

Automatic Stand-By Power Units

By William L. Stelter

Vice President and Chief Engineer
Synchro-Start Products Inc., Skokie, Ill.

Power failures do occur. They often have serious consequences and lasting affects. Synchro-Start's answer to the problem lies in automatically controlled stand-by power units.

NO one knows exactly what would happen if an atomic bomb were dropped on a U. S. industrial area. Still less can anyone predict how each individual plant would fare or what would happen to municipal services.

Because there are so many imponderables, engineers don't really know how to make a building A-bomb proof. Many of the protection measures they have figured out (dispersal of buildings, going underground) are too expensive to be worthwhile for most companies and municipalities. For these reasons the average U.S. plant is a sitting duck.

These conclusions have come out of two meetings of structural experts—one at the Massachusetts Institute of Technology, the other at the University of California, Los Angeles.

Still, that doesn't mean that all protection is impractical. Said John B. Wilbur of MIT: "The difference between no protection and some protection is the difference between darkness and daylight. The difference between some protection and more is merely a matter of degree."

What Wilbur was driving at was this: Wherever it's possible to minimize the danger of an atomic blast without too much trouble, a company or city would be wise to do so. This means strengthening conventional construction by using rigid frames instead of weight-bearing walls, anchoring columns, strengthening fire walls, reinforcing stairwells. Fixtures that might collapse, like false ceilings or hanging equipment, should be taken down or revamped.

Most important suggestion on continuing vital municipal services is to maintain automatically controlled stand-by equipment to generate emergency power in event the main source of power is damaged.

This was startingly exemplified in Chicago when an electrical storm knocked out power lines, bringing industrial plants, hospitals and some municipal services to a standstill.

Newspapers throughout the country the next morning carried the human-interest details with pictures of nurses at one Chicago hospital going about their duties with flashlights, and foremen in one plant wondering what to do about the semi-finished goods on the (then) dead assembly line.

Little noticed were two items buried in type: The Bell Telephone System in Chicago had had emergency power on the line in five seconds after the storm hit, the Sanitary District of Chicago had emergency power going to its pumps in five seconds. Secret of the situation were stand-by, diesel-powered generators, activiated by Synchro-Start automatic engine controls.

Today, many municipalities are turning more and more to the use of automatic engine controls. These automatic controls insure that the instant one power source fails or is put out of commission by any mishap, a stand-by engine, equipped with automatic controls, will be put to work operating a generator for emergency power. With most small engines, the power plant will be on the line producing power in three seconds or less—larger engine in proportion. When the main service is restored, this same control stops the engine and resets itself for the next power demand.

Announcement by Synchro-Start Products, Inc., of a new addition to its line of automatic engine controls, brings to the fore the current boom in the use of such apparatus by municipalities. The new automatic control (Model 2100 10G) not only tests itself and its auxiliary engine daily to make sure everything is in running order against an emergency, but flashes (or rings) an alarm if the auxiliary engine lacks oil, or water, or is over-heated, or anything else is wrong.

Recent municipal installations of automatic controls with a wide variety of diesel engines and generators, indicate that cities all over the country are becoming increasingly aware of the danger of a power break, either from storms, floods, or (perish the thought) war damage.

The city of Brookline, Massachusetts, for example, recently installed such controls with a diesel-generator set to produce emergency power to keep the city's incinerator going in event of an emergency which cuts off the main power. The Boston Herald reports that "this automatically controlled set is considered the model for several more contemplated in the metropolitan Boston area."

In the case of the city of Los Angeles, we find the engineers there installing an automatically controlled 100 KW General Motors diesel generator set. This stand-by installation was placed in the City Hall of San Pedro (California) as emergency equipment to provide light and power for basic operations. The U. S. Weather Bureau Station at Tatoosh Island, Washington, considering the vital character of its operations as a defense outpost, has installed an automatically controlled Waukesha diesel with 15 KW generator to maintain emergency operations in its buildings.

Water, of course, is equally important. The U. S. Navy at North Island, San Diego, California, has automatic equipment installed on a stand-by pumping unit in case of failure of main power. The installation here consists of a Caterpillar engine driving a 12-in Johnson Pump, all ready to take over should a stoppage of main current occur.

Heating of municipal or key buildings is important also. An automatic cranking panel used with a 60 kw, 1800 rpm Caterpillar emergency diesel-electric set has been installed in the new boiler plant at the University of California in Los Angeles. Here, the heating plant would still continue to operate despite curtailment of the main power. The same applies to the automatically controlled Cummins engine and generator installed at Ohio State University's Student Union Building in Columbus, Ohio.

Telephone companies are equally anxious to get fast emergency power. The Southwestern Associated Telephone Company in Hobbs, New Mexico, reported recently that its stand-by equipment (Buda engine and generator) came in handy when "several power failures occurred due to high winds." The automatic controls, wrote Wire Chief F. G. Roberts, Jr., "took over nicely."

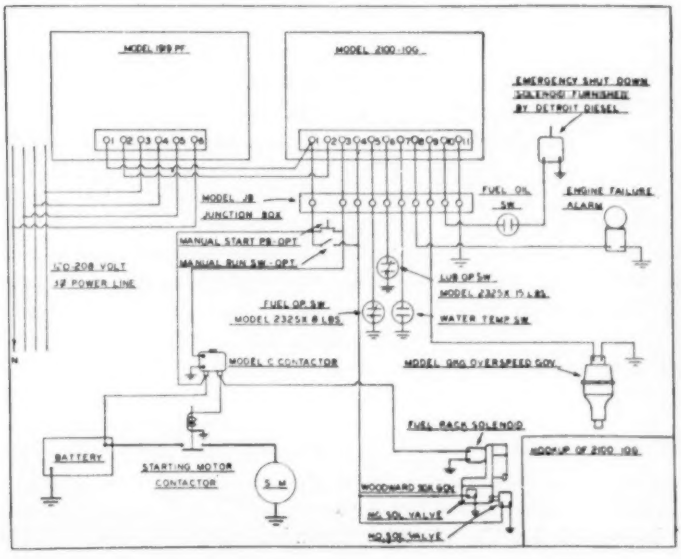
Maintenance of temperature is vital in many municipal functions. For example, the Quincy Market Cold Storage and Warehouse Company has an installation in Boston which municipal engineers are studying for application to municipal sewage operations.

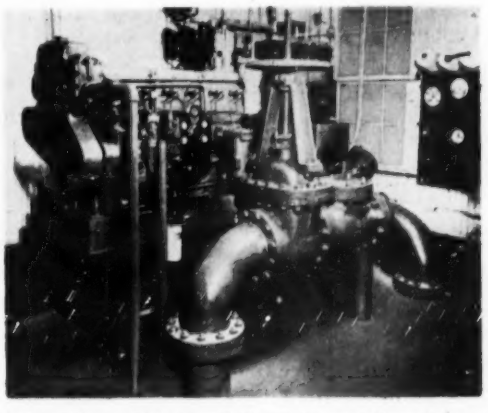
The installation consists of three 75 KVA 3-phase 60-cycle electric machinery generators direct coupled to Hercules diesel engines. The function of this plant is to furnish light and power for the plant. The plant operates in the following manner:

> One engine operates continuously. A second engine starts automatically when the electrical load reaches the full capacity of the first. If at any time the first two engines are operating and a failure should occur, the third engine will be started in place of the one which has failed.
>
> The plant is attended during the daytime, and left completely unattended between the hours of 5 p.m. and 8 a.m. of the next day. Due to this fact, it was necessary to provide in addition to the regular alarm signals, additional provisions for inter-connecting with the local ADT supervisory system. This means that if an engine failure should occur at any time, the proper authorities will be immediately notified.

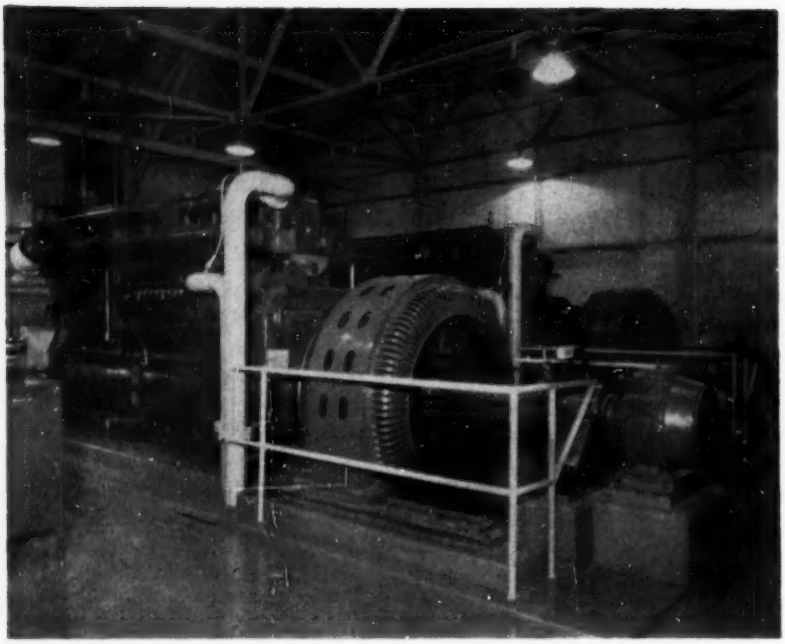
The same situation seems to prevail in hospitals today. There is scarcely a new hospital going up today which does not install automatically controlled stand-by equipment to produce power in event of emergency. Many old hospitals are also installing such stand-by units to furnish emergency power for elevators, operating rooms or heating equipment.

Hospitals utilizing controls of this type dot the country. Their automatically controlled diesel-electric generating sets assure continuous operation in event of a commercial power failure.





Automatic controls guard the water supplies of many American cities such as that of Domopolis, Alabama, (shown above). At left is a typical wiring diagram for one model control as applied to a GM 71 engine.



Northern States Power Co. uses 27 diesels in 10 stationary power plants for standby and peaking service and to facilitate repairs of power distribution lines.

Diesels Integrated with Hydro and Steam

DIESELS are performing an important function in the extensive power system of the Northern States Power Company. They are providing standby service, helping to carry peak loads, and facilitating line and substation repairs.

This utility system, which spans the state of Minnesota and extends into Wisconsin and South Dakota, depends primarily on steam and hydro-electric generating facilities which still produce more than 99 per cent of all kilowatt-hours. However, when the company made a survey in 1946 to determine the best means of meeting the rapidly expanding demand, it was decided that diesel plants could be utilized advantageously at many strategic locations.

Location and Operation

Sites for the plants were chosen carefully to facilitate plant operation and to obtain maximum value from the new facilities. Each installation was tied in with an existing distribution substation, and the generators, producing at either 2300 or 4160 v, could be connected to the distribution feeder bus. In case of a line outage, the local plant could supply power for the surrounding area. The direct connection also helped to relieve overloaded transmission lines and transformers and served to maintain voltage in localities distant from the main generating stations.

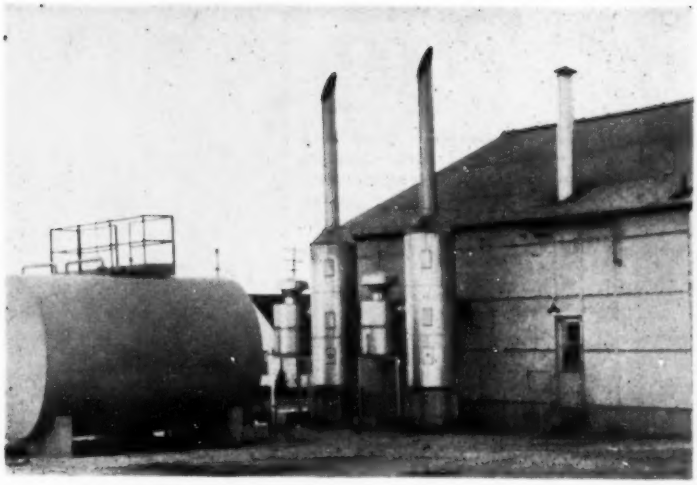
Another factor in choosing the site of each plant was the availability of operating personnel. Since these engines were intended for intermittent service, it was thought desirable to use company men with other regular jobs to run the diesels when necessary. The operators trained for their new part-time jobs included truck drivers, substation operators, linemen, gas plant operators, trouble shooters, laborers, and district superintendents.

Although most of these men had no previous experience in diesel plant operation, the company reports general satisfaction with the use of this kind of personnel. The economic advantages are obvious. Maintenance in all the stations is handled by a man from headquarters in Minneapolis with the help of the local operators.

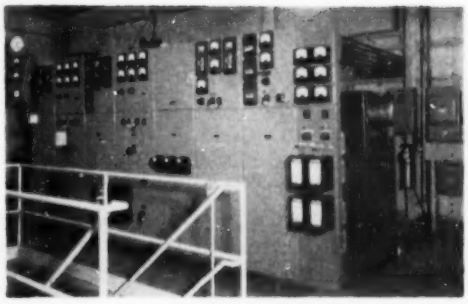
A Typical Installation

The plant at Dodge Center, Minn. presents a typical picture of the operation and service of Northern States' diesel standby plants. Dodge Center is at the extreme end of a transmission loop and the diesels are well located to afford standby protection to the surrounding area in case of line failure. The plant has been used to maintain local service while a transmission line was being rebuilt. This meant not only better service for the consumer, but smaller construction cost for the company and maximum working safety for the line crews. Dodge Center's diesels have also joined the others in the system in helping to carry peak loads.

This is important and valuable service, but not the kind that means large totals in kwhr generated or engine-hours operated. Yet, even here the contribution is considerable. The two Alco diesels at Dodge Center have run as much as 1062 hr in a single year and in four years of intermittent operation have generated more than 2,000,000 kwhr. The plant is unattended except when the engines



Rear of plant showing location of air filters, silencers and storage tanks.



ITE switchboard includes GE diactor regulators, instruments and electrically-operated switchgear.

Implementing a decision to use diesels in meeting growing power demands, Northern States Power Company constructed 10 plants and installed 27 diesels.

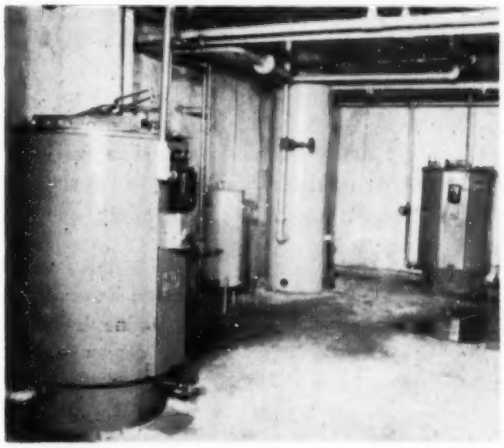
are running, and then either the district-representative or a lineman acts as operator.

Engines and Systems

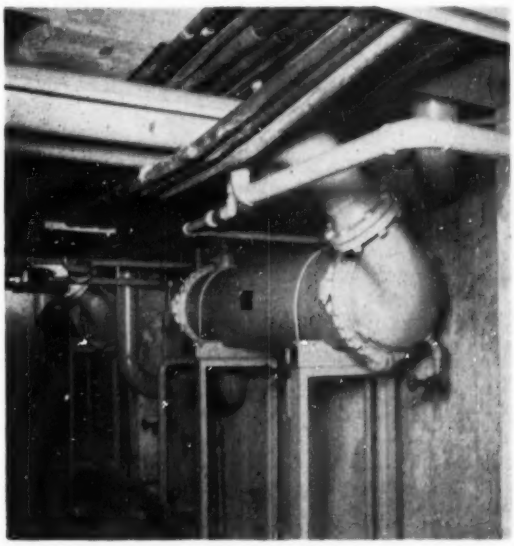
Engines in this plant are identical 4-cycle, turbo-charged Alco diesels each with eight cylinders, 12½-in bore and 13-in stroke, developing rated 1300 hp at 720 rpm. Each engine drives an 1150-kva, 920-kw, 3-phase, 60-cycle, 2400/4160-v Electric Machinery generator with direct-connected 10-kw, 125-v exciter. These engines are arranged for air starting and experience has shown that the diesels can be started and put on the line in a very short time in case of need.

The cooling system for the diesels was designed to provide simplicity of operation for relatively inexperienced personnel and to eliminate the danger of freezing the coolant during winter periods when the plant was idle and unattended. A simple closed cooling system was devised with the engine-driven centrifugal water pumps circulating the coolant through a pair of air-cooled heat exchangers outside the building. The air-cooled exchangers (which are used for all 27 diesels in the system) are Alco Type W-4-12 and are equipped with fans driven by 25-hp electric motors. Engine jacket temperature is controlled by an automatic thermostatic bypass valve.

During the winter months, engine cooling water contains 50 per cent ethylene glycol which solves the problem of damage by freezing. Care is taken to guard against corrosion which might be caused by increasing acidity of the cooling water. Samples are taken regularly for labora-



Lubricating oil for each engine is cleaned by a Hilco purifier with cellulose filtration elements.



Each engine in the plant is served by an individual heat exchanger located adjacent to the engine base.

tory analysis and polished steel specimens are immersed in the engine cooling systems and are removed periodically for inspection. Thus far, no serious corrosion has been observed.

To preserve this expensive anti-freeze solution as long as possible, it is drained from the system for the summer months and stored in a 2500-gal tank in the plant basement. This has the advantage of permitting sludge to settle to the bottom of the tank and the bottom six inches of solution is not returned to the engines. During the summer, soft water treated with sodium chromate is used in the cooling system.

Lubricating oil is circulated through each diesel under pressure by an engine-driven pump and is cleaned continuously by a built-in full-flow filter as well as a bypass purifier with cellulose filtration elements. The lube system includes an oil cooler (in which the lube is cooled by coolant returning from the big air-cooled exchangers to the engines) and a motor-driven auxiliary lube pump. In four years, the two diesels at Dodge Center have averaged 5589 hp hr per gal of lube consumed.

The No. 2 diesel fuel used in this plant is unloaded from trucks into two 9742-gal storage tanks. These tanks are equipped with heaters and arranged so that engine cooling water can be circulated through coils to warm the oil. A motor-driven pump transfers fuel to elevated day tanks from which the oil flows to the engine booster pumps, then through filters to the individual injection pumps.

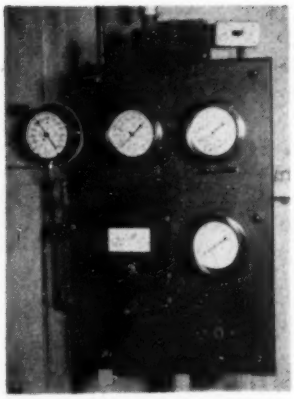
Intake air is drawn through oil-bath filters and supplied to the cylinders by the turbochargers. Exhaust gases vent through vertical silencers. Each engine is served by a gauge board which holds pressure gauges, a multi-point exhaust pyrometer, and an alarm panel.

Summing Up

After nearly five years of experience, Northern States officials feel their decision to build 10 diesel stations has been fully vindicated. It is their judgment that the diesels have performed all intended functions, benefiting the company and its customers.

Principal Equipment

Engines	American Locomotive Co.
Generators	Electric Machinery Co.
Governors	Woodward Governor Co.
Fuel System	
Transfer pumps	Viking Pump Co.
Supply pumps	Tuthill Pump Co.
Injection pumps	American Bosch Corp.
Lube System	
Oil pumps	Geo. D. Roper Corp.
Auxiliary lube pumps	Viking Pump Co.
Filters	Cuno Engineering Corp.
Coolers	American Locomotive Co.
Air compressors	Gardner-Denver
Switchboard	ITE
Instruments	General Electric Co.
Alarm panel	Viking
Pyrometer	Illinois Testing Laboratories, Inc.
Air filters	Continental Whirlwind
Silencers	Maxim Silencer Co.



For each engine there is a gauge panel with necessary alarms, exhaust pyrometer and pressure gauges on the lube, fuel and water systems.

What Do You Know!

Here are more questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 102 to check them.

1. The most logical choice of engine for installation in sewage plants of the activated sludge type is:
   a. Oil diesel b. Dual-fuel
   c. Spark ignition gas engine

2. Overall thermal efficiency (Btu basis) being realized in some activated sludge sewage disposal plants is about:
   a. 30 per cent c. 70 per cent
   b. 50 per cent d. 90 per cent

3. Two common cases of crankshaft failures are bending strains due to misalignment, and torsional vibration. The latter is generally typified by:
   a. A fracture in the rough shape of a helix
   b. A break at right angles to the shaft axis

4. Fairbanks-Morse's opposed-piston engine is only built for use with liquid fuels.
   a. True b. False

5. Many private utility systems are integrating diesel power plants into their systems. Which of the following is the least pertinent of the reasons for their use?
   a. Flexibility ideal for standby service
   b. Facilitates line and substation repairs
   c. Reduces highline maintenance
   d. Helps carry peak loads

6. During winter operation of closed cooling systems in standby service permanent-type antifreeze (ethylene glycol, etc.) affords excellent protection against freezing. It can be reused if one of the following precautions is observed.
   a. Check specific gravity
   b. Filter to remove impurities
   c. Check corrosion inhibition

7. Where several engines must supply power to most closely match a widely varying load, commercial automatic controls can be arranged to meet all the requirements.
   a. True b. False

8. A desirable feature of a thermostat installation is the ability to recirculate the medium being cooled, without cooling, until the proper temperature is reached.
   a. True b. False

THE BUYERS' GUIDE

The Buyers' Guide is a service to our readers and to advertisers in Diesel Power and Diesel Transportation. *Here will be found in a convenient list for quick reference diesel engines and accessories advertised in this magazine and a substantial number of other engines and products of leading manufacturers who advertise in this classified directory.*

DIESEL ENGINE DIRECTORY

Two-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, Over 1000

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4 N. Y

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, over 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

MEDIUM HIGH SPEED, 700 to 1200 r.p.m.

Horsepower, 1 to 50

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, over 1000

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

HIGH SPEED, over 1200 r.p.m.

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

Four-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 51 to 100

WHITE-ROTH CORP.
Lorain, Ohio

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, over 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 1 to 50

WHITE-ROTH CORP.
Lorain, Ohio

Horsepower, 51 to 100

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BURMEISTER & WAIN AMERICAN CORP
17 Battery Place
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM HIGH SPEED 700 to 1200 r.p.m.

Horsepower, 1 to 50

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 51 to 100

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77 L.I., New York

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

HERCULES MOTORS CORPORATION
11th & Market S.E.
Canton 2, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MANUFACTURING COMPANY
3073 S. Chase Avenue
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

NORDBERG MANUFACTURING COMPANY
3073 S. Chase Avenue
Milwaukee 7, Wisconsin

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N.Y.

HALLETT MFG. CO.
1601 W. Florence Ave.
Inglewood, Calif.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 51 to 100

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CUMMINS ENGINE CO., INC.
Columbus, Indiana

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 101 to 500

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CUMMINS ENGINE CO., INC.
Columbus, Indiana

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

CUMMINS ENGINE CO., INC.
Columbus, Indiana

DIESEL PLANT ACCESSORIES

Adapters, Engine Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Additives

LUBAL, INC.
375 W. Rich St.
Columbus 8, Ohio

Wynn Oil Company
1151 W. 5th St.
Azusa, Calif.

Additives for Diesel Fuel Oil

LUBAL, INC.
375 W. Rich St.
Columbus 8, Ohio

Wynn Oil Company
1151 W. 5th St.
Azusa, Calif.

Aftercoolers, Air Compressor

See also headings under "Coolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

PERFEX CORP.
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin

QUINCY COMPRESSOR COMPANY
217 Main Street
Quincy, Illinois

YOUNG RADIATOR CO.
Racine, Wisconsin

Aftercoolers, Supercharger

See also "Supercharging Intercoolers"

HARRISON RADIATOR DIVISION
General Motors Corporation
Washburn Street
Lockport, New York

PERFEX CORP.
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Air Compressors

See also "Compressors, Air"; "Starting Units".

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Compressors, Starting

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Dehydrators

J. F. PRITCHARD & COMPANY
210 W. 10 Street
Kansas City 5, Missouri

Air Dryers, Instrument

J. F. PRITCHARD & COMPANY
210 W. 10 Street
Kansas City 5, Missouri

Air Filters

See also "Cleaners"; "Filters, Air"

AIR MAZE CORP.
25000 Miles Road
Cleveland, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

CONTINENTAL AIR FILTERS, INC.
2522 Helm Street
Louisville 1, Kentucky

DONALDSON COMPANY, INC.
666 Pelham Blvd.
St. Paul 4, Minnesota

VORTOX COMPANY
121 S. Alexander Ave.
Claremont, California

Air Filters, Automatic, Self-Cleaning

AIR MAZE CORP.
25000 Miles Road
Cleveland, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky

CONTINENTAL AIR FILTERS COMPANY
2522 Helm Street
Louisville 1, Kentucky

Air Filters, Crankcase

See also headings under "Breathers"

FRAM CORP.
Providence 16, R. I.

Air Starting Motor, Diesel Engine

See also "Starting Motors, Diesel Air" "Cranking Motors, Air"

INGERSOLL-RAND CO.
11 Broadway
New York 4, N.Y.

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Air Tools

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Air Velocity Meters

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Ill.

Alarm Systems, Pressure & Temperature

See also headings under "Controls & Automatic"

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

Alternators

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, N.Y.

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Ammeters

See also "Meters, Electrical Indicating".

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Ammeters—Tong Test (Clamp On) Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Anti-Rust Compounds

See also "Rust Preventatives"

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Asbestos, Sheet

See also headings under "Gaskets"

FITZGERALD MFG. COMPANY
Torrington, Connecticut

Automatic Controls, Pressure

See also headings under "Controls" and below.

PENN CONTROLS, INC.
Goshen, Indiana

Automatic Controls, Starting

SALYERS EQUIPMENT CO.
726 E. Washington Blvd.
Los Angeles 21, California

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Automatic Controls, Temperature

See also "Alarm Systems"

DE.ROIT CONTROLS CORP.
5900 Trumbull Ave.
Detroit, Michigan

FULTON SYLPHON DIVISION
ROBERTSHAW—FULTON CONTROLS CO.
Knoxville 4, Tennessee

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, N.Y.

PENN CONTROLS, INC.
Goshen, Indiana

Automatic Transmissions

ALLISON DIVISION
GENERAL MOTORS CORP.
Indianapolis, Indiana

Automotive Diesel Fuel

See also "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Diesel Fuel Oils"; "Motor Fuels"

PURE OIL COMPANY
35 East Wacker Drive
Chicago, Illinois

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Automotive Greases

See also "Greases," "Lubricants"

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 E. 42 Street
New York 17, N. Y.

Automotive Lubricating Oils

See also "Lubricating Oils"

PURE OIL COMPANY
35 East Wacker Drive
Chicago, Illinois

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

Auxiliary Combination Units

BALDWIN-LIMA-HAMILTON CORP.
545 N. 3rd Street
Hamilton, Ohio

Auxiliary Diesel Generating Sets

See also "Diesel Generating Sets"; "Emergency Diesel Generator"; "Emergency Lighting Plants".

CUMMINGS ENGINE COMPANY, INC.
Columbus, Indiana

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

Ball & Roller Bearing Greases

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Bars, Bronze

See also headings under "Bronze"

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Batteries, Nickel Cadmium, Storage

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Mass.

NICKEL CADMIUM BATTERY CORP.
Pleasant Street
Easthampton, Massachusetts

Batteries, Storage

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Mass.

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

Battery Service Accessories

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Bearings

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bearings, Aluminum

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Babbitted

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Bearings, Babbitted and Bronze Bushed

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bearings, Bronze

See also "Bronze Bearings"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Bronze and Steel Backed, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Copper-Lead

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bearings, Lead, Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Piston Pin

See "Bearings Wrist Pin"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

Bearings, Self-Lubricating

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

Bearings, Sleeve, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

Bearings, Special Alloys

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bearings, Steel-Backed, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bearings, Wrist Pin

See also "Bearings, Piston Pin"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bellows, Brass

FLEXONICS CORPORATION
1315 S. Third Avenue
Maywood, Illinois

Bellows, Stainless Steel

FLEXONICS CORPORATION
1315 S. Third Avenue
Maywood, Illinois

ZALLEA BROTHERS
Locust & Taylor Sts.
Wilmington, Delaware

Blowers, Centrifugal

ELLIOTT COMPANY
Jeannette, Pennsylvania

Blowers, Rotary, Positive

READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin

Blowers, Scavenging and Supercharging

ELLIOTT COMPANY
Jeannette, Pennsylvania

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin

READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

Boilers, Exhaust Gas, Waste Heat

See also "Waste Heat Boilers"

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

THE SIMS COMPANY
P. O. Box 1096
Erie, Pa.

Brazing Equipment Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Ave.
Cleveland 1, Ohio

Breather Filters

See also, "Air Filters, Crankcase"

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.

VORTOX COMPANY
121 S. Alexander Ave.
Claremont, California

Bronze Bearings

See also "Bearings, Bronze"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

Bronze Washers

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

Burner Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa, 2, Oklahoma

Bushings, Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

WALWORTH COMPANY
60 East 42 Street
New York 17, N.Y.

Bushings, Copper-Lead

A. ALLAN & SON
601 Bergen Street
Harrison, New Jersey

Bushings, High-Lead Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bushings, Lead-Bronze Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bushings, Split Rolled

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Bushings, Steel-Backed, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE COMPANY
New Castle, Pennsylvania

Cables, Battery

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Cam Followers

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Camshafts, Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Camshafts, Reground

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Camshafts, Repaired

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Carbon Brushes

NATIONAL CARBON COMPANY
30 East 42nd Street
New York, N. Y.

Carbon Solvents

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

LUBAL, INC.
375 W. Rich St.
Columbus 8, Ohio

Castings

HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Castings, Alloy Iron

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Castings, Grey Iron

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Casting Repairs

WASHINGTON IRON WORKS
Sherman, Texas

Castings, Steel (Med & Large)

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Centrifugal Purifiers, Lube & Fuel Oil

See also headings under "Conditioners"; Purifiers"; and "Separators"

CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifuges, Oil Purifying

See heading above.

CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Chain Drives, Complete

LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana

Chains, Dual Engine Drive

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Power Transmission

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Roller

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Silent

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Timing

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chargers, Battery

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Chromium Plating

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

SPAR-TAN ENGINEERING CO.
Western Licensee—Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, Calif.

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

Clarifiers, Oil

See also headings under "Centrifugal Purifiers"; "Separators"

CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey

Cleaner, Aviation Cold Immersion Type

THE CURRAN CORPORATION
S. Canal Street
Lawrence, Mass.

Cleaner, Injector, Carbon Removing

THE CURRAN CORPORATION
S. Canal Street
Lawrence, Mass.

Cleaners, Air, Oil Bath Type

See also headings under "Filters, Air" and "Silencers"

DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 4, Minnesota

VORTOX COMPANY
121 S. Alexander Avenue
Claremont, California

Cleaners, Dry Type

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Cleaning Compounds

See also Cleaners"

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Clutch Discs

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Illinois

Clutches, Automotive

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Friction and Jaw

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Power Transmission

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Combustion, Diesel

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Combustion Systems, Designs

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Combustion Systems, Tests

LANOVA CORP.
38-15 18th Avenue
Long Island City 1, N.Y.

Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Compressors, Air

See also "Air Compressors"; "Starting Units"

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.

ERIE METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDING COMPANY
Racine, Wisconsin

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Illinois

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

WORTHINGTON CORP.
Harrison, New Jersey

Compressor Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Compressors, Reciprocating, Air and Gas, All Drives

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
New York, N. Y.

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

WORTHINGTON CORP.
Harrison, New Jersey

Condensers, Atmospheric Evaporative Steam & Vapor

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Conditioners, Fuel & Lube Oil

See also "Centrifugal Purifiers"; "Purifiers"; "Separators"

BOWSER, INC.
Fort Wayne 2, Indiana

HILLIARD CORPORATION
120 West 4th Street
Elmira, N. Y.

WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois

Conduit, Flexible & Liquid Tight

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Connecticut

Connecting Rods

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

Connecting Rod Borers

VAN NORMAN COMPANY
3640 Main Street
Springfield, Masssachusetts

Connecting Rod Pin Bushing Borer

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Conecting Rods, Forged

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Controls, Automatic Starting

See also "Automatic Controls"; "Alarm Systems"

SALYERS EQUIPMENT COMPANY
726 E. Washington Blvd.
Los Angeles 21, Calif.

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Illinois

Controls, Engine Safety

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

SYNCHRO-START PRODUCTS INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Controls, Fuel Governing Reverse Gear

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

Controls, Hydraulic

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Controls, Liquid Level

PENN CONTROLS, INC.
Goshen, Indiana

Controls, Locomotive

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, N. Y.

Controls, Pneumatic

THE POWERS REGULATOR COMPANY
3410 Oakton Street
Skokie, Illinois

Controls, Pressure

PENN CONTROLS, INC.
Goshen, Indiana

Controls, Temperature

AMERICAN MOTORS CO.
21 Nevins Avenue
Richmond 5, California

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

THE POWERS REGULATOR CO.
3410 Oakton St.
Skokie, Illinois

Coolers, Compressed Air, Gas

See also "Aftercoolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Evaporative Type

See headings under "Evaporators".

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Jacket Water

See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

E. C. COOLEY COMPANY
1186 Folsom Street
San Francisco 3, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

THE MARLEY COMPANY, INC.
222 W. Gregory Blvd.
Kansas City 5, Missouri

PERFEX CORPORATION
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin

J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Jacket Water, Materials For Cleaning

See also "Cleaning Compounds"; "Cleaners"; "Exchangers"

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Lube Oil, Materials For Cleaning

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Oil and Water

See also "Oil Coolers"; "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

E. C. COOLEY COMPANY
1186 Folsom Street
San Francisco 3, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

PERFEX CORPORATION
500 W. Oklahoma Ave.
Milwaukee 7, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Repair & Service

E. C. COOLEY COMPANY
1186 Folsom Street
San Francisco 3, Calif.

Cooling Equipment, Engine Radiators

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling Towers

See also "Spray Towers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY COMPANY, INC.
222 West Gregory Blvd.
Kansas City 5, Missouri

J. F. PRITCHARD & CO.
210 W. 10th Street
Kansas City 5, Missouri

Cooling Tower Fans

J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri

Core Oils

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Cork Isolation

THE KORFUND CO., INC.
48-20A 32nd Place
Long Island City 1, N.Y.

Couplings

WALWORTH COMPANY
60 East 42 Street
New York 17, N. Y.

Couplings, Chain

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

Couplings, Cut-Out Type

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

Couplings, Flexible

ELLIOTT COMPANY
Jeanette, Pennsylvania

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P. O. Box 298
Baltimore 3, Maryland

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

THE WEATHERHEAD COMPANY
300 E. 131st Street
Cleveland 8, Ohio

Couplings, Flexible Shaft

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

Couplings, Floating Shaft Type

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Hydraulic

WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Couplings, Hydraulic Pipe

WALWORTH COMPANY
60 East 42 Street
New York 17, N. Y.

Couplings, Roller Chain

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Ave.
Indianapolis 7, Indiana

LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana

Couplings, Self-Aligning

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P. O. Box 298
Baltimore 3, Maryland

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Slip

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Crankcase Pressure Detector

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Cranking Motors, Air

See also "Air Starting Motors"; "Starting Motors, Air"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Cranking Motors, Electric

See also "Starting Motors, Electric"

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Crankshaft Grinders

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

NATONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

VAN NORMAN CO.
3640 Main Street
Springfield 7, Mass.

Crankshaft Machinists

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas

WASHINGTON IRON WORKS
Sherman, Texas

Crankshafts

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

ERIE FORGE & STEEL COMPANY
15 & Cascade Streets
Erie, Pennsylvania

WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Crankshafts Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Crankshafts, Emergency Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

Crankshafts, Hand Chrome Surfaced

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Crankshafts, Metallized

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Crankshafts, Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas

WASHINGTON IRON WORKS
Sherman, Texas

Crankshafts, Thermit-Welded

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

Cutting Fluids

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 E. 42d St.,
New York 17, N. Y.

Cutting Oils

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma

PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Cylinder Heads

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Cylinder Liners

See also "Liners, Diesel Cylinder" and "Centrifugally Cast Cylinder Liners".

SEALED POWER CORP.
500 Sanford St.
Muskegon 61, Michigan

Cylinder Liners, Porous Chrome Reclaiming

SPAR-TAN ENGINEERING CO.
Western Licensee-Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, California

Cylinder Liners Reclaimed

G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

Cylinder Repairs

WASHINGTON IRON WORKS
Sherman, Texas

Cylinder Sleeves

SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan

Cylinder, Bored & Finished

BRODIE SYSTEM
115 Clifton Place
Brooooklyn 5, New York

Damper, Torsional Vibration

See also "Vibration"

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Degreasers

See also "Solvents"

PHILLIPS MANUFACTURING COMPANY
3475 Touhy Avenue
Chicago 45, Illinois

Dehydrators, Diesel Fuel

BOWSER, INC.
Fort Wayne 2, Indiana
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa 8, Oklahoma

Detergents

OAKITE PRODUCTS, INC.
19 Rector St.
New York 6, N. Y.
STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Detonation Indicator

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Development, Diesel Engine

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Diesel Auxiliary Power Units, Marine

BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York

Diesel Engine Cleaner (Parts)

See also "Solvents"; "Degreasers"

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

Diesel Engine Lubricating Oil

See also "Lubricating Oils"; "Cylinder Oil"

ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.
THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Diesel Engines, Reconditioned

See also "Diesel Repairs" and "Repairs Diesel".

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Diesel Fuel Oil

See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".

ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco 20, Calif.
TEXAS COMPANY
135 East 42nd Street
New York 17, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, New York

Diesel Fuel, Tar & Carbon Dispersing Agent

LUBAL, INC.
375 West Rich Street
Columbus 8, Ohio

Diesel Generating Sets

See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
CUMMINS ENGINE CO., INC.
Columbus, Indiana
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.
HALLETT MANUFACTURING COMPANY
1601 West Florence Avenue
Inglewood, California
HERCULES MOTOR CORPORATION
11th & Market S. E.
Canton, Ohio
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio
D. W. ONAN & SONS, INC.
University Avenue S. E. at 25th
Minneapolis 14, Minnesota
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Generating Sets, Automatic Installation

BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York

Diesel Generator Sets, Portable

BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York

Diesel Industrial Engines

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Diesel Industrial Tractors

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

Diesel Locomotives

See also headings under "Locomotives".

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
La Grange, Illinois

Diesel Locomotives, Elec. & Mech. Drives

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady, New York

Diesel Marine Engines

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Diesel Nozzle Testers

See also "Nozzle Testers".

AUTOMOTIVE PRODUCTS, INC.
1700 S. E. Grand Avenue
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio
KENT MOORE ORGANIZATION INC.
5-105 General Motors Building
Detroit, Michigan
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Diesel Power Units

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
CUMMINS ENGINE CO., INC.
Columbus, Indiana
HARNISCHFEGER CORPORATION
DIESEL ENGINE DIVISION
Crystal Lake, Illinois
HERCULES MOTOR CORP.
11th & Market S E
Canton 2, Ohio
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

Diesel Pumping Units

BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York

Diesel Railway Generating Sets

A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York, New York
WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisc.

Diesel Replacement Engines for Chevrolet Trucks

HERCULES MOTOR CORPORATION
11th & Market S. E.
Canton 2, Ohio

Diesel Replacement Engines for Ford Trucks

HERCULES MOTOR CORPORATION
11th & Market S. E.
Canton 2, Ohio

Diesel Schools

UTILITIES ENGINEERING INSTITUTE
DIESEL DIVISION
2521 Sheffield Avenue
Chicago 14, Ill.

Diesel Testing Equipment

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Penna.
DIESEL PLANT SPECIALTIES CO.
424 Portage Aveune
Stevens Point, Wisconsin
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois
KIENE DIESEL ACCESSORIES INC.
10352 Pacific Avenue
Franklin Park, Illinois

Drives, Chain

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Ave.
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Dual Chain Engine Drives

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

Dynamometers and Prony Brakes

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio

Emergency Diesel Generators

See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Packaged Generators".

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
HALLETT MANUFACTURING COMPANY
1601 West Florence Avenue
Inglewood, California
HARNISCHFEGER CORPORATION
DIESEL ENGINE DIVISION
Crystal Lake, Illinois
SALYERS EQUIPMENT COMPANY
726 E. Washington Boulevard
Los Angeles 21, California
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Emergency Lighting Plants

See also heading above.

BALDWIN-LIMA-HAMILTON CORPORATION
545 North 3rd Street
Hamilton, Ohio
DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 West Outer Drive
Detroit 28, Michigan
D. W. ONAN & SONS, INC.
University Avenue S. E. at 25th
Minneapolis 14, Minnesota
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Engine Cooling System Cleaners

See also "Exchangers, Heat Materials for for Cleaning"; "Scale Removal" Cleaning Compounds.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engine Cooling System Rust Preventives

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engine Parts, Diesel

RODER-BLACKBURN INTERNATIONAL
149 Broadway
New York, New York

Engine Repair Stands

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

Engines, Diesel, New

WAUKESHA MOTOR COMPANY
Waukesha, Wisconsin

Engines, Diesel, Used

A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York 7, New York

Engineering Service, Diesel Engine

LANOVA CORPORATION
38-15 30th Street
Long Island City 1, New York

Evaporators, Steam

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Exchangers, Heat

See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York
J. F. PRITCHARD & COMPANY
210 West 10 Street
Kansas City 5, Missouri

Exchangers, Heat, Materials for Cleaning

See also headings under "Cleaner"; "Cooler"; "Cooling"; and "Engine"

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Exhaust Flexible Hose

See also headings under "Flexible"; "Hose"; and "Tubing"

DIESEL PLANT SPECIALTIES CO.
424 Portage Street
Stevens Point, Wisconsin

Expansion Joints, Corrugated, Stainless Steel

FLEXONICS CORP.
1315 S. Third Ave.
Maywood, Illinois
ZALLEA BROTHERS
Locust & Taylor Streets
Wilmington, Delaware

Fans, Axial Flow

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P. O. Box 298
Baltimore 3, Maryland
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Centrifugal

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Radiator Cooling

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P. O. Box 298
Baltimore 3, Maryland
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Filtering Systems

See headings under "Filters"

BOWSER, INC.
Fort Wayne
Indiana
BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORPORATION
2 Main Street
Melrose 76, Massachusetts
DULUTH FILTER COMPANY
2913 West Superior Street
Duluth, Minnesota
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
PUROLATOR PRODUCTS INC.
970 New Brunswick Avenue
Rahway, New Jersey
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air

See also "Air Cleaners"; "Air Filters", and Headings under "Breathers".

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio
AMERICAN AIR FILTERS COMPANY, INC.
445 Central Avenue
Louisville 8, Kentucky
CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Automatic Self-Cleaned

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.
CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky
CUNO ENGINEERING COMPANY
80 South Vine Street
Meriden, Connecticut
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air, Dry Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Dry Type (Crankcase)

AMERICAN AIR FILTER COMPANY, INC.
445 Central Avenue
Louisville 8, Kentucky
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
FRAM CORP.
Providence 16, Rhode Island

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air, Oil Bath Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.
VORTOX COMPANY
121 South Alexander
Claremont, California

Filters, Air, Open-Screen Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Panel Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
VORTOX COMPANY
121 South Alexander
Claremont, California

Filters, Compressed Air

AMERICAN AIR FILTER CO., INC
445 Central Avenue
Louisville 8, Kentucky
BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street,
Meriden, Connecticut
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, 5-Micron, Diesel Fuel

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
C. A. V. DIVISION OF LUCAS
ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORPORATION
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING COMPANY
80 South Vine Street
Meriden, Connecticut
ERIE METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
U. S. HOFFMAN MACHINERY CORPORATION
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

Filters, Fuel Oil

See also "Oil Filters".

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
BOWSER, INC.
Fort Wayne 2, Indiana
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
C. A. V., DIVISION OF LUCAS ELECTRICAL
SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
DULUTH FILTER COMPANY
2913 West Superior Street
Duluth, Minnesota
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Ave.
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WILLIAM W. NUGENT & CO., INC.
410 No. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, N. Y.
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Gasoline

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
ERIE METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania
FRAM CORP.
Providence 16, R. I.
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
U. S. HOFFMAN MACHINERY CORPORATION
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

Filters, Lubricating Oil

See also "Oil Filters".

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio.
BOWSER, INC.
Fort Wayne 2, Indiana
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie
New York
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
DULUTH FILTER COMPANY
2913 West Superior Street
Duluth, Minnesota
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
MICHIANA PRODUCTS CORPORATION
Michigan City, Indiana
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, N. Y.
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Lubricating Oil, Magnetic

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
STAPLES & PFEIFFER
528 Bryant Street,
San Francisco 17, California
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Panel Type

AMERICAN AIR FILTER COMPANY, INC.
445 Central Avenue
Louisville 8, Kentucky
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

Filter, Silencer Dry Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Fittings, Hose, Detachable
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Fittings, Tube
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Flexible Connections, Stainless Steel
See also headings under "Hose" and "Tubing".
AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
ZALLEA BROTHERS
Locust & Taylor Streets
Wilmington, Delaware

Flexible Exhaust Connections
See also headings under "Hose" and "Tubing".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
FLEXONICS CORP.
1315 So. 3rd Ave.
Maywood, Ill.
ZALLEA BROTHERS
Locust & Taylor Streets
Wilmington, Delaware

Flexible Metal Hose
See also "Hose, Flexible, Metallic".
AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
ZALLEA BROTHERS
Locust & Taylor Streets
Wilmington, Delaware

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water Lines
See also headings under "Hose" and "Tubing".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Forgings, Aluminum
WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Forgings, Drop
INDIANAPOLIS DROP FORGING CO.
1300 Madison Avenue
Indianapolis, Indiana
TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATION
Titusville, Pennsylvania
WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Forgings, Steel Carbon & Alloy
ERIE, FORGE & STEEL CORPORATION
15th & Cascade Streets
Erie, Pennsylvania

Forgings, Steel & Iron
ELLWOOD CITY FORGE CO.
Ellwood City, Pa.
TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATON
Titusville, Pennsylvania
WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Fuel Injection Systems, Repair & Service
See also "Injection Systems, Service"; "Service, Injection System".
DIESEL ENGINEERING & MFG. CORP.
200 N. Laflin Street
Chicago 7, Illinois
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut
INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

Fuel Oil Additives
See also "Additives"; "Fuel Oil Treatment".
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
WYNN OIL COMPANY
1151 West 5 Street
Azusa, California

Fuel Oil, Diesel
See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.
STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Gages, Draft, Portable Indicating
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Gages, Fuel
THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.

Gages, Tank Contents
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.
VIKING PUMP COMPANY
4th & Jorgensen Streets
Cedar Falls, Iowa

Gaskets
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Asbestos
THE FITZGERALD MFG. CO
Torrington, Conn.

Gaskets, Cork
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Fibrous
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Metallic
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Oil and Water
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gearmotors
ELLIOTT COMPANY
Jeannette, Pennsylvania

Gear Lubricants
TIDE WATER ASSOCIATED OIL COMPANY
17 Battery Place
New York, New York

Gears, Cut
CONE-DRIVE GEARS
DIVISION, MICHIGAN TOOL CO.
7171 East McNichols Road
Detroit 12, Michigan

Gears, Increasers
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden 7, Connecticut

Gears, Reduction
CONE-DRIVE GEARS
DIVISION, MICHIGAN TOOL CO.
7171 East McNichols Road
Detroit 12, Michigan
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Conn.

Gears, Reduction With Cut-Off Clutch
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Connecticut

Generating Sets, Electric
See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minnesota
SALYERS EQUIPMENT COMPANY
726 E. Washington Blvd.
Los Angeles 21, California
A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York, New York

Generators, A. C.
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
ELLIOTT COMPANY
Jeanette, Pennsylvania
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, New York
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin

Generators, Charging

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusets
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, Charging, Direct Current Rectified A.C.

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATON
2401 Columbus Avenue
Anderson, Indiana
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, D. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORPORATION
329 E. First Street
Dayton 1, Ohio
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
THE ELLIOTT COMPANY
Jeanette, Pennsylvania
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, New York
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin
RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio

Generators, Engine Driven

BALDWIN-LIMA-HAMILTON CORP.
545 N. 3rd St.
Hamilton, Ohio
BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
DELCO PRODUCTS DIVN.
GENERAL MOTORS CORPORATION
329 E. First Street
Dayton 1, Ohio
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin
D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minnesota
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Governors, Centrifugal

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR COMPANY
1625 Ohio Avenue
Anderson, Indiana

Governors, Hydraulic

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR COMPANY
1625 Ohio Avenue
Anderson, Indiana
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed, Engine Shut-Off

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR CO
1625 Ohio Ave.
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Graphite, Wheel Flange Lubrication Rods

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Greases

See also "Lubricants"; "Automotive Greases".

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Greases, Automotive

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Greases, Industrial

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Grey Iron and Steel Castings

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio

Grinders, Surface, Cylinder Head & Block

LEMPCO PRODUCTS
Dunham Road
Bedford, Ohio

Gun Greases

TIDE WATER ASSOCIATED OIL CO
17 Battery Place
New York, New York

Heat Exchangers

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Heat Exchangers, Air Cooled

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport 10, N. Y.
THE MARLEY COMPANY
222 West Gregory Blvd.
Kansas City 5, Missouri
PERFEX CORPORATION
500 W. Oklahoma Avenue
Milwaukee 7, Wisconsin
J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri

Heat Exchangers, Industrial

AEROFIN CORPORATION
410 South Geddes Street
Syracuse 4, New York
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Washburn Street
Lockport, New York
HENRY VOGT MACHINE COMPANY
1000 W. Ormsby Street
Louisville 10, Kentucky
YOUNG RADIATOR COMPANY
Racine, Wisconsin

Heat Exchangers, Oil and Water

See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
E. C. COOLEY COMPANY
1186 Folsom Street
San Francisco 3, California
HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
THE SIMS COMPANY
Box 1096
Erie, Pa.
YOUNG RADIATOR CO.
Racine, Wisconsin

Heat Treating Equipment, Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Ave.
Cleveland 5, Ohio

Heavy Duty Lubricants

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

High Temperature Grease
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Hose, Flexible Assemblies
See also headings under "Flexible" and "Tubing".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64 Street
New York 23, New York
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hose, Flexible Metallic
See also headings under "Flexible" and "Tubing".
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Hoses, Flexible Wire Braid
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hose, Metal For Steam, Oil, Compressed Air
See also headings under "Flexible Hose" and "Tubing".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
FLEXONICS CORPORATION
1315 S. 3rd Avenue
Maywood, Illinois

Hydraulic Fluids
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York

Hydraulic. Governors
See also "Governors, Hydraulic" and "Governors, Overspeed"
WOODWARD GOVERNOR CO.
5001 North 2nd Street
Rockford, Illinois

Hydraulic Oils
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Hydraulic Test Pumps
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Ignition Systems, Gas Engine
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield 7, Mass.
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Ignition Transformers
AMERICAN BOSCH CORPORATION
1664 Main Street
Springfield 7, Mass.

Impact Wrenches
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin

Indicator Valves
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Indicators, Carbon Dioxide Portable
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Indicators, Diesel Engine
See also "Compression Testers, Diesel Engine", and other headings under "Indicators".
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Illinois
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Indicators, Oxygen, Portable
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Indicators, Pressure-Time, Diesel Engine
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Bennett St.
Pittsburgh 8, Pa.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 No. Ravenswood Ave.
Chicago 40, Illinois
KENT MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Indicators, Sight Flow
BOWSER, INC.
Fort Wayne 2, Indiana
WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Indicators, Speed
BROWN & SHARPE MANUFACTURING CO.
235 Promenade Street
Providence 1, Rhode Island
HERMAN H. STICHT COMPANY, INC.
27 Park Place
New York, New York

Indicators, Speed, Electric
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Ave.
Newark, New Jersey

Induction Heating Equipment
OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 5, Ohio

Industrial Flashlights & Batteries
NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Industrial Oils
See also headings under "Lubricants" and "Greases".
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York

Ingots and Billets
ERIE FORGE & STEEL CORPORATION
15th & Cascade Streets
Erie, Pennsylvania

Injection Calibration & Test Stands
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Injection Systems, Fuel
ADECO PRODUCTS INC.
5435 N. Wolcott Avenue
Chicago 40, Illinois
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DIESEL ENGINEERING & MFG. CORP.
200 N. Laflin Street
Chicago 7, Illinois
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

Injection Systems, Service
See also "Fuel Injection Systems, Repair & Service"; "Service, Injection System"
DIESEL ENGINEERING & MFG. CORP.
200 North Laflin Street
Chicago 7, Illinois
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

Injector and Pump Replacement Parts
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Injector Test Stand
See also "Nozzle Testers"
AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14,. Oregon
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Injectors & Pump Exchange
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Inspection, Manufacture and Overhaul, for Defects
MAGNAFLUX CORP.
7300 W. Lawrence Ave.
Chicago 31, Illinois

Intake Silencers—Cleaners, Dry Type
See also "Silencers, Intake".
BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Laboratory, Diesel Engine
LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Lifts, Portable Hydraulic
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Liner Plating, Porous Chrome
SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, California

Liners, Diesel Cylinder
See also "Cylinder Liners."
HUNT-SPILLER MFG. CO.
383 Dorchester Ave.
Boston 27, Mass.

Lock Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.
WALWORTH COMPANY
60 East 42 Street
New York 17, N. Y.

Locomotives, Diesel

See also "Diesel Locomotives"
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, New York

Lubricants

See also "Industrial Oils", "Greases" and "Automotive Greases"
ASHLAND OIL & REFINNG CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricants, Diesel Engine

MID-CONTINENT PETROLEUM CORPORATION
Box 381
Tulsa 2, Oklahoma

Lubricating Oil Compound

CITIES SERVICE OIL COMPANY
60 Wall Tower
New York, New York

Lubricating Oils

See also "Automotive Lubricating Oils"; "Oils Lubricating" and "Cylinder Oils".
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
CITIES SERVICE OIL COMPANY
60 Wall Tower
New York 5, New York
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING CO.
600 Fifth Ave.
New York 20, N. Y.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricating Oils, Industrial

MID-CONTINENT PETROLEUM CORPORATION
P. O. Box 381
Tulsa 2, Oklahoma

Lubricators, Force Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Fresh Oil

MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Mechanical

See also "Mechanical Force Feed Oil Systems".
MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Multiple Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Sight Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Machine Shop Products

BALDWIN-LIMA-HAMILTON CORPORATION
545 North 3rd Street
Hamilton, Ohio
VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Machine Tools

BALDWIN-LIMA-HAMILTON CORPORATION
545 North 3rd Street
Hamilton, Ohio
BROWN & SHARPE MANUFACTURING CO.
Providence 1, Rhode Island
LEMCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio
VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Machine Tools, Precision

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Machine Tools, Precision Honing

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Machine Tools, Surface Grinding

PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri

Magnetos, High Tension

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
SCINTILLA MAGNETO DIVISION
Bendix Aviation Corporation
Sidney, New York

Magnetos, Low Tension

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
SCINTILLA MAGNETO DIVISION
Bendix Aviation Corporation
Sidney, New York

Manifolds

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Marine Reverse & Reduction Gears

THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Conn.

Melting Furnaces, Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland, Ohio

Metal Spraying & Finishing

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Meter, Elapsed Time

BURLINGTON INSTRUMENT COMPANY
203 North 3rd Street
Burlington, Iowa

Meters, Electrical Indicating

See also "Ammeters"
BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, N. J.

Meters, Fuel Oil

BOWSER, INC.
Fort Wayne 2, Indiana
NEPTUNE METER COMPANY
50 West Street
New York 20, New York

Micrometers

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island
SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin

Motor & Generator Brushes

NATIONAL CARBON COMPANY
30 East 42 Street
New York, New York

Motor Fuels

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".
CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Motor Generator Sets—Electro Plating, Low Voltage

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORPORATION
329 East First Street
Dayton 1, Ohio
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin

Motors, Electric, A. C.

ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Motors, Electric, A. C. & D. C.

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio
ELLIOTT COMPANY
Jeanette, Pennsylvania
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
KURZ & ROOT COMPANY, INC.
232 E. North Island Street
Appleton, Wisconsin
RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio
A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York 7, New York
STAR-KIMBLE MOTOR DIVISION
MIEHLE PRINTING PRESS & MFG. COMPANY
200 Bloomfield Avenue
Bloomfield, New Jersey

Motors, Gear

RELIANCE ELECTRIC & ENGINEERING CO
1058 Ivanhoe Road
Cleveland 10, Ohio
STAR-KIMBLE MOTOR DIVISION
MIEHLE PRINTING PRESS & MANUFACTURING CO.
200 Bloomfield Avenue
Bloomfield, New Jersey

Motor Oils

MID-CONTINENT PETROLEUM CORPORATION
P. O. Box 381
Tulsa 2, Oklahoma

Mufflers, Exhaust

NELSON MUFFLER CORPORATION
Stoughton
Wisconsin
RIKER MANUFACTURING
4809 Detroit Avenue
Toledo, Ohio

Mufflers, Intake & Exhaust

See also headings under "Silencers".
BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois
DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 4, Minnesota
KITTELL MUFFLER & ENGINEERING COMPANY
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Mufflers, Spark Arresting

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois
KITTELL MUFFLER & ENGINEERING COMPANY
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.
NELSON MUFFLER CORPORATION
Stoughton
Wisconsin

Nozzle Testers

See also "Injector Test Stand".
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Nozzles, Spray, Water Cooled

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Nozzles, Spray, Water Cooling

See also "Spray Nozzles, Water".
BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
J. F. PRITCHARD & CO.
210 West 10th Street
Kansas City 5, Mo.

Nuts, Lock

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.
WALWORTH COMPANY
60 East 42 Street
New York 17, New York

Nuts, Plain & Castle

COLUMBIA NUT & BOLT COMPANY, INC.
945 Main Street
Bridgeport 3, Connecticut

Oil Conditioners

See also headings under "Centrifuges"; "Conditioners".
BOWSER, INC.
Fort Wayne 2, Indiana
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
U. S. HOFFMAN MACHINERY CORP.
Filtration Division
Thompson Road
Syracuse 6, New York
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Filters

See also "Filters", "Lubricating Oils".
DULUTH FILTER COMPANY
2913 West Superior Street
Duluth, Minnesota
FRAM CORP.
Providence 16, R. I.
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma

Oil Purification Systems, Filtering Earth Type

BOWSER, INC.
Fort Wayne 2
Indiana
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

Oil Purification Systems Pressure and Gravity Types

BOWSER, INC.
Fort Wayne 2
Indiana
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Ave.
Lebanon, Indiana
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Reclamation Systems

DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York
THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.

Oil Separators

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie
New York
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Systems, Pressure & Gravity Type

WM. W. NUGENT & COMPANY, INC.
410 North Hermitage Avenue
Chicago 22, Illinois

Oil Testing Equipment (Engine Room Kits)

THE GERIN CORP.
Avon, New Jersey

Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORPORATION
GULF REFINING COMPANY
3702 Gulf Building
Pittsburgh 30, Pa.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York

Packing, Oil Wiper

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.

Packing, Rod Metallic

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.

Packing Glands, Cast Copper-Lead

A. ALLAN & SON
601 Bergen Street
Harrison, New Jersey

Packing Sheets

FITZGERALD MANUFACTURING COMPANY
Torrington, Connecticut

Pipe Fittings, Compression

WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Piping, Prefabricated

WALWORTH COMPANY
60 East 42 Street
New York 17, New York

Piston Pin Bearings

See also headings under "Bearings"

CLEVELAND GRAPHITE BRONZE COMPANY
17000 St. Clair Avenue
Cleveland 10, Ohio

Piston Pin Bushing Borer

JOHNSON BRONZE COMPANY
New Castle
Pennsylvania
VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Piston Pins

OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

Piston Rings

C. LEE COOK MFG CO.
76 Beaver St.
New York, N. Y.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
KOPPERS CO., INC.
METAL PRODUCT DIVISION
P. O. Box 298
Baltimore 3, Maryland
SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFACTURING COMPANY
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Oil Control

C. LEE COOK MANUFACTURING COMPANY
76 Beaver Street
New York, New York
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFAC URING COMPANY
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Sealing

C. LEE COOK MFG. CO
76 Beaver St.
New York, N. Y.
KOPPERS CO. INC.
METAL PRODUCTS DIV'SION
P. O. Box 298
Baltimore 3, Maryland
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFAC URING COMPANY
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Wear Rings

A. ALLAN & SON
601 Bergen Street
Harrison, New Jersey

Pistons

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan

Pistons, Aluminum Alloy

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan

Pistons, Cast Iron

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

Plating, Chrome

SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corporation
2445 Enterprise Street
Los Angeles 21, California
VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

Plating, Porous Chrome

SPAR-TAN ENGINEERING CO.
Western Licensee—Van Der Horst Corp.
2445 Enterprise St.
Los Angeles 21, Calif.

Pliers, All Types

SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin

Pneumatic Tools

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York

Portable Contractors' Power Units

See also other headings this page.

WAUKESHA MOTOR CO
P.O. Box 377
Wa.kesha, Wisconsin

Portable Power Units

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 West Outer Drive
Detroit, Michigan

Power Take-Off Units

HARNISCHFEGER CORPORATION
DIESEL ENG'NE DIVISION
Crystal Lake, Illinois
ROCKFORD CLUTCH DIV.
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Ill.

Power Units

CUMMINS ENGINE COMPANY
Columbus Indiana
HARNISCHFEGER CORPORATION
DIESEL ENGINE DIVIS'ON
Crystal Lake, Illinois
HERCULES MOTOR CORP.
11th & Market S. E.
Canton 2, Ohio

Presses, Arbor, Electric & Hydraulic

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Pressure Switches

PENN CONTROLS, INC.
Goshen, Indiana

Pressuregraph

ELECTRO PRODUCTS LABORATORIES, INC.
4501 North Ravenswood Avenue
Chicago 40, Illinois

Pullers, Gear, Wheel, Bushing

SNAP-ON TOOLS CORP.
8064—28th Avenue
Kenosha, Wisconsin

Pumping Units, Diesel

See also "Diesel Pumping Units".

GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York
A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York, New York

Pumps, Automatic Reversing

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Centrifugal

BROWN & SHARPE MFG. CO.
Providence 1, R. I.

Pumps, Centrifugal Corrosion Resistant

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORP.
30 E. 42nd St.
New York, New York

Pumps, Cooling Water

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Fuel Oil Injection

See also "Injection Equipment", etc.

ADECO PRODUCTS, INC.
5435 North Wolcott Avenue
Chicago 40, Illinois
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DIESEL ENGINEERING & MANUFAC URING CORP.
200 North Laflin Street
Chicago 7, Illinois
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

Pumps, Fuel Transfer

ERIE METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania
GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Hydraulic

BROWN & SHARPE MANUFACTURING CO.
Providence 1 Rhode Island
GEORGE D. ROPER CORPORATION
173 Blackhawk Park Avenue
Rockford, Illinois
VIKING PUMP COMPANY
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Hydraulic Controls

GEORGE D. ROPER CORPORATION
173 Blackhawk Park Avenue
Rockford, Illinois
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

Pumps, Lubricating Oil

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland, Ohio
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.
GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.
SCHWITZER-CUMMINS
1125 Massachusetts Avenue
Indianapolis 7, Indiana
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19. Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Oil

Erie METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania
MANZEL, DIV. OF FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, New York
GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Rotary Gear Type

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, R. I.
GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19. Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Rotary, Hand-Driven

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Rotary, Vane-type

BROWN & SHARPE MANUFACTURING COMPANY
235 Promenade Street
Providence 1, Rhode Island

Pumps, Stripped Models

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, R. I.
GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Illinois
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19. Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Vacuum

QUINCY COMPRESSOR COMPANY
217 Main Street
Quincy, Illinois
READ STANDARD CORP.
370 Lexington Avenue
New York 17, N. Y.

Purifiers, Fuel Oil

See also "Reclaimers, Oil"; and headings under "Oil".

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

Purifiers, Industrial Oil

See Heading Above.

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

Purifiers, Lubricating Oil

See also "Reclaimers, Oil"; and headings under "Oil".

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORPORATION
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois
THE SHARPLES CORPORATION
2300 Westmoreland Strcet
Philadelphia 40, Pennsylvania

Purifiers, Oil

See heading above.

THE BRIGGS FILTRATION CO.
River Road
Washington. 16, D. C.
CENTRICO, INC
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

Pyrometers, Exhaust

THE BRISTOL COMPANY
Waterbury, Connecticut
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrometers, Portable

THE BRISTOL COMPANY
Waterbury, Connecticut
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrotac

ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago, Illinois

Radiators, Engine Cooling

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
PERFEX CORPORATION
500 W. Oklahoma Avenue
Milwaukee 7, Wisconsin
YOUNG RADIATOR CO.
Racine, Wis.

Rail Car Engines

CUMMINS ENGINE COMPANY
Columbus, Indiana
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Reamers, Adjustable, Replaceable Blades

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Reclaimers, Oil

See also headings under "Purifiers" and "Oil".

THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois

Regulators, Current & Voltage

See also headings under "Voltage".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Chicago 7, Illinois

Regulators, Generator Voltage

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
BURLINGTON INSTRUMENT COMPANY
203 N. 3rd Street
Burlington, Iowa
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Regulators, Temperature

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, Calif.

FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
PENN CONTROLS, INC.
Goshen, Indiana

Relays, Sensitive

WESTON ELECTRICAL INSTRUMENT COMPANY
614 Frelinghuysen Avenue
Newark 5, New Jersey

Repairs, Diesel

See also "Diesel Repairs"; "Diesel Engines Reconditioned".
BRODIE SYS.EM
115 Clifton Place
Brooklyn 5, New York
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 17, New York

Residual Fuel Purifiers

THE DELAVAL SEPARATOR COMPANY
Poughkeepsie, New York

Reversing Switches

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rheostats, Plating Tank Type

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rotor Blower Service Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Rust Preventives

See also "Anti-Rust Compounds"
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California
YOUNG RADIATOR CO.
Racine, Wisconsin

Rust Removers

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Safety Controls, Engine

See also "Controls, Engine Safety"
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Scale Removal

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Scavenging Air Blowers

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin

Schools, Diesel Mechanics

See also "Diesel Schools".
INTERSTATE TRAINING SERVICE
4035 N. E. Sandy Blvd.
Portland, Oregon
UTILITIES ENGINEERING
2525 Sheffield Avenue
Chicago 14, Illinois

Screw Machine Products

HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Screw Machine Products, Hardened & Ground

HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut

Scuffing Rings

A. ALLAN & SON
601 Bergen Street
Harrison, N. J.

Sealing Rings

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.

Seals, Automatic Shaft

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Self Retaining Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

Separators

See also headings under "Centrifuges"; Conditioners"; Purifiers"; "Clarifiers".
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

Shafts, Hardened and Ground

ELLWOOD CITY FORGE CO.
Ellwood City, Pennsylvania
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma

Shafts, Steel, Carbon Alloy

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Shop Equipment

VAN NORMAN COMPANY
3640 Main Street
Springfield 7, Massachusetts

Silencers, Air Filter, Intake

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.

Silencers, Exhaust

See also headings under "Mufflers".
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Silencers, Intake

See heading above.
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER COMPANY
85 HOMESTEAD AVENUE
Hartford 5, Connecticut

Silencers, Spark Arresting

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Sludge, Lignifiers

LUBAL, INC.
375 W. Rich Street
Columbus 8, Ohio

Snubbers, Intake & Exhaust

BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois

Snubbers, Spark Arresting

BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois

Solenoids, D. C., Continuous Duty

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Solvents

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.
GULF OIL CORPORATION
GULF REFINING COMPANY
Gulf Building
Pittsburgh 30, Pa.
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.

Solvents, Degreasing

See also "Degreasers"
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
PHILLIPS MANUFACTURING COMPANY
3475 Touhy Avenue
Chicago 45, Illinois

Solvents for Petroleum Residues

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Spark Arrestors

KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Spark Plugs

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Special Maintenance Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Special Tools, Mechanical Gear Box

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Speed Reducers and Increasers Cone-Drive Gears

DIVISION MICHIGAN TOOL CO.
7171 E. McNichols Road
Detroit 12, Michigan

Spray Nozzles, Fuel Injection

See also under "Nozzles"; "Valves".

ADECO PRODUCTS, INC.
5435 N. Wolcott Avenue
Chicago 40, Illinois
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION of
LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DIESEL ENGINEERING & MFG. CORP.
200 N. Laflin Street
Chicago 7, Illinois
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

Spray Nozzles, Water

See also "Nozzles, Spray, Water Cooling".

BINKS MANUFACTURING CO.
3114 Carroll Avenue
Chicago 12, Illinois
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Mo.

Spray Ponds

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

Spray Towers

See also "Cooling Towers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

Sprockets

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana

Starting Air Compressors, Engine Driven

See also headings under "Compressors"

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
QUINCY COMPRESSOR COMPANY
217 Main Street
Quincy, Illinois

Starting Air Compressors, Motor Driven

See also headings above

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
QUINCY COMPRESSOR COMPANY
217 Main Street
Quincy, Illinois

Starting Batteries, Storage

See also headings under "Batteries".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Starting Motors, Air

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Starting Motors, Electric

See also "Cranking Motors, Electric".

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Steam Cleaning Equipment

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Steel Camshaft Repair

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Steel Castings

See also "Castings"; etc.

HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Strainers, Oil

BOWSER, INC.
Fort Wayne 2, Indiana
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeanette, Penna.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California

Strainers, Water

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeanette, Penna.
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
WALWORTH COMPANY
60 East 42 Street
New York 17, New York

Strainers, Water, Single & Duplex

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
ELLIOTT COMPANY
Jeannette, Pa.
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California

Supercharger Intercoolers

See also "Intercoolers" and "Aftercoolers"

YOUNG RADIATOR CO.
Racine, Wis.

Supercharging Blowers

See also "Blowers, Scavenging and Supercharging"; "Turbochargers, Superchargers".

ELLIOTT COMPANY
Jeanette, Penna.
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, New York
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Switchboards and Instruments

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Switches, Electric Starting

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Switches, Manual

SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Switches, Solenoid

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

Switches, Starting

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Switchgear

ELECTRIC MACHINERY & MFG. CO
800 Central Avenue
Minneapolis 13, Minn.

Synchronizers, Automatic

BURLINGTON INSTRUMENT CO.
203 N. 3d St.
Burlington, Iowa
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Systems, Fuel Injection

See also headings under "Injection"; "Fuel"; "Nozzles", etc.

HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut

Tachometers, Centrifugal

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Electrical

RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Tachometers, Hand

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Mechanical

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Temperature Recorders

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Temperature Regulators, Cooling Water

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Test Stands, Diesel Fuel Injector

See also "Injector Test Stands"; etc.
AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Avenue
Portland 14, Oregon

Testing Instruments, Electrical

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Testing Instruments, Oil, Engine Room Type

GERIN CORPORATION
Avon, New Jersey

Tests, Diesel Engine

LANOVA CORPORATION
38-15 30th Street
Long Island City 1, N. Y.

Thermatic Fan Drive

SCHWITZER-CUMMINGS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Thermocouples

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Thermometers

W. C. DILLON & CO., INC.
14621 Keswick Street
Van Nuys, California

Thermometers, Bi-metallic, Glass

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Dial Indicator

W. C. DILLON & CO., INC.
14621 Keswick Street
Van Nuys, California
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Thermometers, Dial Indicating, Distance Type

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Illinois
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Thermometers, Distant Reading, Resistance Type

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Flue Gas

W. C. DILLON & CO., INC.
14621 Keswick Street
Van Nuys, California

Thermometers, Portable Recording

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Timing Chains

See also "Chains, Timing"
D AMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana
LINK BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.

Tools, Mechanic's Hand

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 – 28th Ave.
Kenosha, Wis.

Torque Converters

ALLISON DIVISION
GENERAL MOTORS CORPORA ION
Indianapolis, Indiana

Torque Testing Fixtures

P. A. STURTEVANT COMPANY
Addison, Illinois

Tubing, Corrugated, Flexible Metallic

See also headings under "Flexible" and Hose".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 W. 64th Street
New York 23, N. Y.
FLEXONICS CORPORATION
1315 S. 3rd Avenue
Maywood, Illinois
ZALLEA BROTHERS
Locust & Taylor Streets
Wilmington, Delaware

Tubing, Flexible Metal

See heading above.
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.

Tubing, Flexible, Non-Metallic

WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Turbochargers, Superchargers

See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".
ELLIOTT COMPANY
Jeanette, Penna.
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, New York
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Unit Injectors, Fuel Oil

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York

Valve Adjusters, Hydraulic

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valve Regrinders

SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin
VAN NORMAN COMPANY
3640 Main Street
Springfield 7, Mass.

Valve Seat Grinders

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Valve Seat Inserts

PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri

Valve Seats

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valves, Air, Ammonia & Gas Compressor

WALWORTH COMPANY
60 East 42 Street
New York 17, New York

Valves, Engine Indicator

KIENE DIESEL ACCESSORIES INC.
10352 Pacific Avenue
Franklin Park, Illinois

Valves, Packless

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

Valves, Rebuilt and Hardfaced

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Valves, Sight Feed

WILLIAM W. NUGENT & CO.
410 No. Hermitage Avenue
Chicago 22, Ill.

Valves, Solenoid Operated

PENN CONTROLS, INC.
Goshen, Indiana

Valves, Thermostatic

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
THE POWERS REGULATOR COMPANY
3410 Oakton Street
Skokie, Illinois

Valves, Three Way

WALWORTH COMPANY
60 E. 42 Street
New York 17, N. Y.
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Vapor Degreasing

PHILLIPS MANUFACTURING CO.
3475 Touhy Avenue
Chicago 45, Illinois

Variable Speed Drives

ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minnesota

Vent Duct, Flexible

AMERICAN VENTILATING HOSE COMPANY
DIVISION OF
CALLAHAN ZINC-LEAD COMPANY, INC.
100 Park Avenue
New York 17, New York

Vessels, Pressure
THE KORFUND COMPANY, INC.
48-20A 32nd Place
Long Island City 1, New York

Vibration Control
THE KORFUND COMPANY, INC.
48-20A 32nd Place
Long Island City 1, New York

Vibration Eliminators
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
109 West 64 Street
New York 23, New York
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Viscosity Indicating Devices
THE GERIN CORPORATION
Avon, New Jersey

Voltage Regulators
BURLINGTON INSTRUMENT CO.
203 W. 3rd St.
Burlington, Iowa
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Volt-Ammeters, Clamp-on Type
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Washers, Bronze & Steel, Bronze-Lined
See also "Bronze Washers"
CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Avenue
Cleveland 10, Ohio
JOHNSON BRONZE COMPANY
New Castle
Pennsylvania

Waste Heat Boilers
See also "Boilers, Waste Heat"; "Boilers, Exhaust Gas".
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Water Cooling Equipment
See also headings under "Coolers" and "Heat Exchangers"; "Exchangers, Heat".
AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York
MARLEY CO., INC.
222 West Gregory Blvd.
Kansas City 5, Missouri
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

Water-Oil Separators
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma

Water Separators & Filters Mechanical
ERIE METER SYSTEMS, INC.
1602 Wagner Avenue
Erie, Pennsylvania

Water Temperature Regulators
See also "Temperature Regulators, Cooling Water"; "Regulators, Temperature".
AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond, California
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Wearing Rings
A. ALLAN & SON
601 Bergen Street
Harrison, N. J.

Welding, Carbon Products
NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORP.
30 E. 42nd St.
New York, New York

Welding, Diesel Parts
BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Windshield Wipers, Electric
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts

Wrenches
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.
WALWORTH COMPANY
60 East 42 Street
New York 17, New York

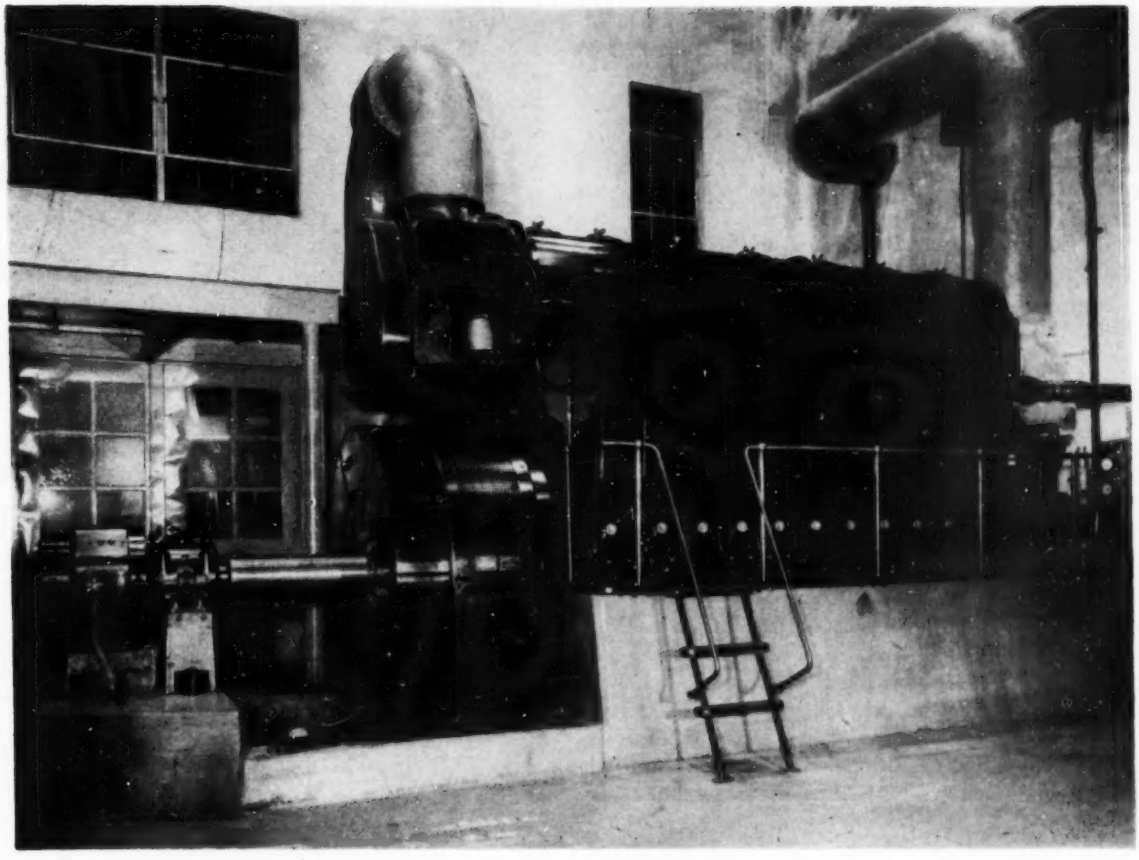
Wrenches, Box, Open End
SNAP-ON TOOLS CORP.
8064 — 28th Avenue
Kenosha, Wisconsin

Wrenches, Socket
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Wrenches, Torque
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

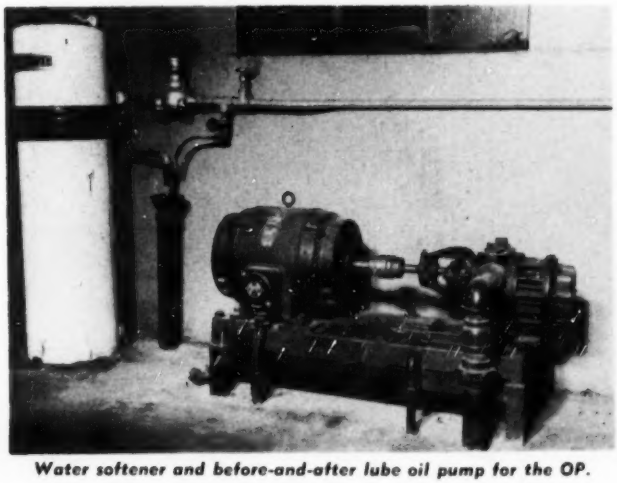
Please remember to say you saw it in

Diesel Power and Diesel Transportation



Rayville Boasts First Dual Fuel O. P.

Rayville's municipal plant has other claims to distinction, but currently rates interest as a showplace of the O-P engine's dual-fuel performance. Average fuel cost for 7,688,000 kwh—3.19 mills per kwh.



Water softener and before-and-after lube oil pump for the OP.

FIRST Fairbanks-Morse opposed-piston engine ever installed for dual-fuel operation completed 8875 hr of service by the end of 1952 in the Rayville, La., municipal power plant. In that period, the O-P was the most efficient unit in the plant, producing 7,688,000 kwh at an average fuel cost of 3.19 mills per kwh.

The 10-cyl Model 38D8-⅛ FM engine, rated 1600 hp at 720 rpm, was installed in mid-1950 in the space formerly occupied by a 360-hp diesel. It drives directly an 1136-kw, 2400-v alternator with direct-connected exciter.

In September 1950, the engine began regular operation on natural gas with small charges of oil as pilot fuel after running its first 284 hours on fuel oil. The unit has worked a steady 6-day week ever since. For three or four months when the cotton gins are running at full speed the O-P operates 24 hours a day at loads from 1000 to 1100 kw. Other times the engine carries about 750 kw for some 15 hours a day. Superintendent Henry Blakeman reports that operation of the engine has been completely trouble-free without an enforced shutdown. The unit runs smoothly and steadily at virtually full load, week after week.

Some Figures

In more than two years of service, the O-P produced 7,688,000 kwh while consuming 84,500 mcf of natural gas and 58,428 gal of pilot oil. This is an average of 10.9 cu ft of gas and 0.0076 gal of oil per kwh. According to Mr. Blakeman, the gas has a heating value of about 800 Btu per cu ft and at full load the engine produces a kwh on 10.7 cu ft of gas and 0.006 gal of oil, a total heat input of 9412 Btu.

With gas at 22.5 cents per mcf, and fuel oil at 9.5 cents a gal, avearage cost per kwh for the engine's full dual-fuel production has been just 3.19 mills.

Naturally, the engine builder has had special interest in the performance of this unit and prevailed upon Rayville officials to pull pistons after 4800 hr for a check of wear on rings, liners, bearings, timing chain, and sprockets. Mr. Blakeman reports that nowhere could he measurable wear. In two and a half years the only repair has been replacement of two injection nozzle tips.

Plant Growth

Pioneering is nothing new to Rayville. The town bought out a utility company in 1915, taking over a small distribution system and a 35-kw steam-driven generator. The first FM engine, a 75-hp unit, was acquired the next year. Then followed a long succession of F-M diesels: a 150-hp Type Y, Style V engine in 1924 followed by a similar 100-hp unit later the same year; a 480-hp Model 33 diesel in 1927; a 300-hp Model 32E14 in 1938; a 1000-hp Model 33F16 in 1945; and finally the 1600-hp Model 38D-⅛ in 1950.

Today, only the four newest engines remain in the plant. The oldest and smallest engines were removed to make way for later units. But things have been happening to these engines. The 480-hp Model 33 was the first of its type to be installed in that territory back in 1927. Then in 1939, the diesel was converted to modern open head design. Finally, in 1950 the 23-year-old engine was converted to dual-fuel service at the same time and the two units ran their first full month on natural gas in June 1950. Joined by the O-P, the gas-burning engines were able to carry the full peak loads which reached 1900 kw in 1952.

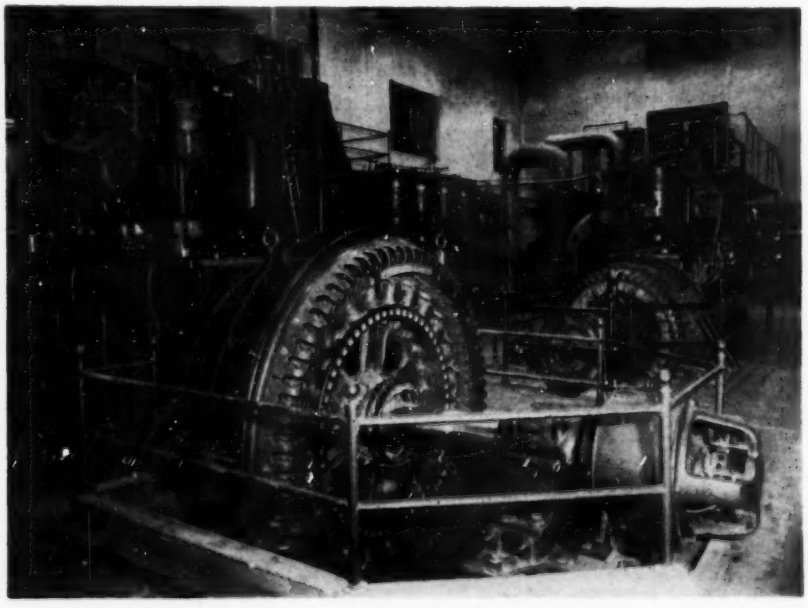
Even the 1950 plant expansion was not sufficient to meet this community growth and the town sold $285,000 in revenue bonds on October 29, 1952 to finance the purchase of a 1920-hp engine. The new unit will be a 12-cyl opposed-piston Fairbanks-Morse dual-fuel engine and will replace the 300-hp diesel, the last oil engine in the plant. An unusual testimony of the public's confidence in the plant and its management was the fact that the bond issue was approved without a single dissenting vote.

This speaks well of the plant and its operation under the direction of Henry Blakeman, Superintendent of Light and Water. The scarcity of dissenting votes also points to a good public relations job on the part of other city officials, including Mayor Loy C. Clonginger; Town Clerk W. A. Cooper; and Alderman J. Pervy Barker, James R. Craig, William P. Fletcher, William N. Gaines, and J. E. Moore. Also indicated by the vote was the fact that the people in the community are well informed of the benefits of municipal power.

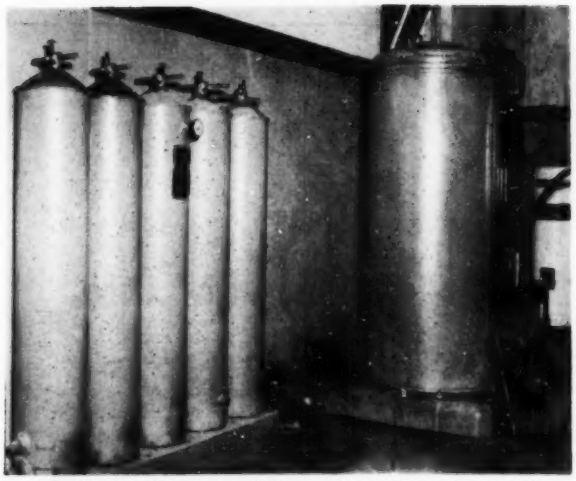
Dual-Fuel Economy

The effect of economical gas fuel is evident in Table I which gives figures on fuel consumption and costs for the past five years. In 1949, the last full year on oil, average cost per kwh was 8.5 mills. In 1950, the transition year, it was down to 4.7 mills. In 1951 and 1952, years of full dual-fuel operation, the plant average was 3.4 mills.

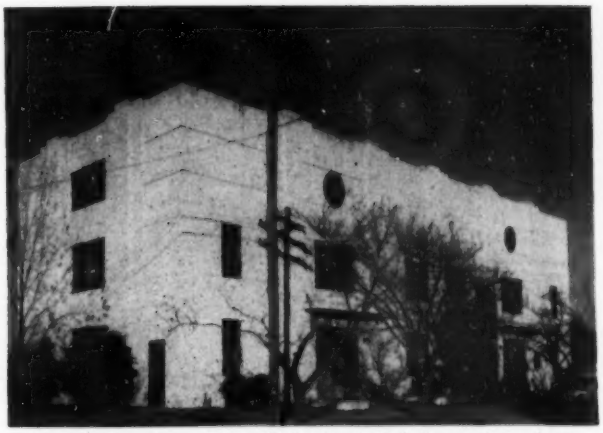
This has been a profitable plant for decades, but in



The Rayville plant includes (left to right) a 1000-hp Model 33F16, a 300-hp Model 32E14, the 1600-hp Model 38D81/8, and a 480-hp Model 33. All are F-M engines.



A bank of cellulose-type filters and purifier maintain lube.



An exterior view of Rayville's Municipal Generating plant.

recent years profits have climbed impressively. Table II shows how the plant earned an operating profit of $280,935.53 in the five fiscal years ending September 30, 1952. The most profitable year was the last, when operating profit reached $77,910.05.

Table III gives details of income and expenditures for this year. Profits are used to pay off bonded indebtedness, to help run other city departments, and for public improvements such as sewage system, city hall, swimming pool, airport, stadium, fire equipment, street paving, and the like.

At the same time, the municipal electric system has given consumers a rate schedule that encourages use of electric appliances. This has been one factor in the rapid expansion of plant production which has more than doubled in the last five years. Another factor has been the growth and progress of the community. Rayville is the parish seat of Richland Parish and the trading center of an area rich in cotton, timber and livestock and spiced with oil. Here is located one of the largest inland cotton warehouses in the country.

In the past three years, 100 new residences have been constructed and population has risen to 4500. In the past two years, the town has gained a new national bank, a new telephone building, a new theatre, a new parish health center, two new churches, a $500,000 parish courthouse, and a $300,000 public school.

Lube, Water and Fuel

The success of the plant has firm basis in sound management and operating policies. The heavy duty prime movers have the protection of full accessory equipment. A detergent-type lubricating oil is used in the O-P pressure system. Some oil is bled from this circuit through a 10-element cellulose filter.

In addition, lube oil is drawn from the sump by a motor-driven pump, put through another cellulose filter, and returned to the sump. Oil is cooled in coils in an evaporative cooler. Lube oil economy has been good with the O-P using 50 gal for a week of 24-hr operation at average of 5376 rated hp hr per gal.

All engines in the plant have closed cooling systems using treated jacket water. The two big engines are served by a pair of evaporative coolers equipped with thermostatic controls which regulate cooler shutters and bypass jacket water as necessary to maintain desired temperatures.

A 32-gravity fuel oil is unloaded from truck or tank car into a 10,000-gal storage tank. It then passes through an activated clay purifier to individual day tanks which are placed vertically and calibrated at 10 gal to the inch for easy stick measurement. Each engine is also equipped with an overhead emergency fuel tank.

If normal pilot oil pressure fails, gas supply is shut off automatically and a check valve opens admitting oil to the main injection pumps. This is sufficient to keep the engine operating for about two hours while the normal pilot fuel system is being repaired.

Principal Equipment

Engine	Fairbanks, Morse & Co.
Generator	Fairbanks, Morse & Co.
Governor	Woodward Governor Co.
Fuel System	
Oil	Simmons Oil & Refining Co.
Purifier	Honan-Crane
Filters	Wm. W. Nugent Co.
Gas	Louisiana Power Co.
Meter	American Meter Co.
Lube System	
Oil	Esso Standard Oil Co.
Filters	Honan-Crane
	Fairbanks, Morse & Co.
Auxiliary pump	Geroge D. Roper Co.
Jacket Water	
Pumps	Fairbanks, Morse & Co.
Evaporative coolers	Fairbanks, Morse & Co.
Water softener	Permutit Co.
Air filters	American Air Filter Co.
Exhaust snubbers	Burgess-Manning
Switchboard	General Electric Co.
Alarm panel	Fairbanks, Morse & Co.
Exhaust pyrometers	Illinois Testing Laboratories, Inc.

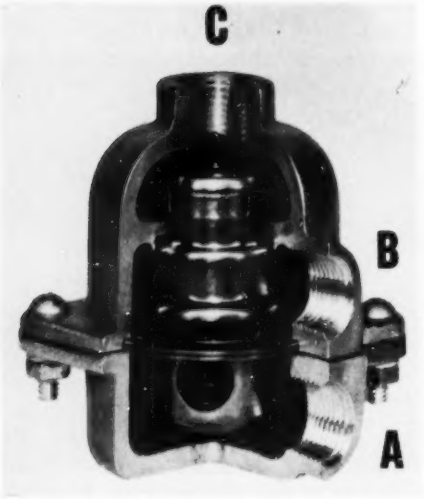


Fig. 1 Cutaway showing the internal construction of the new Amot thermostat. The position of the sliding valve is for a "cold" condition. "A" always remains open. When installed as in Fig. 4, water would be recirculated through the engine for fast warm-up through "B".

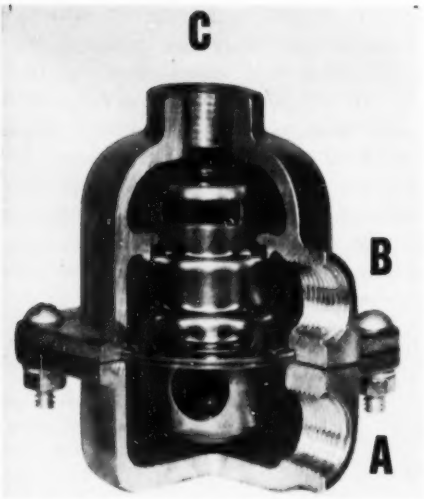


Fig. 2 In this case the condition is "hot" and full flow is through "C" as "B" is now closed. Refering to Fig. 3, under these conditions water from the engine would go to the heat exchanger for maximum cooling effect. In practice, flow would be proportioned to maintain a constant and even temperature.

Small Thermostat for Lube and Water Temperature Control

NO matter what the size of an engine, best results are obtained when cooling water and lube oil temperatures are properly controlled. This is the line of reasoning that induced American Motors Company of Richmond, California, to expand their line of thermostats downward. The purpose was to extend the availability of their thermostatic controls down to the smaller engines.

Although temperature control is just as important for the small engines as for the larger ones, there has been the matter of availability and cost to contend with. Amot's new Model "C" was developed with these two factors in mind. Where formerly, their thermostats could accommodate from 1½-in to 6-in pipe sizes, these new units are built in ½-in, ¾-in and 1-in pipe sizes, indicative of the size of engines for which they were designed.

These thermostats are completely self-contained and are not provided with any external adjustments. They are factory-set and it is only necessary to specify the desired operating temperature. Reference to the sectional views will indicate the general construction. The housings are of Naval bronze and the internal elements in contact with the water or oil are made of Everdur. This lasting and corrosion-resistant material selection was adopted since the units have wide usage in the marine field.

The fit of the sliding valve is loose to minimize the possibility of sticking even under conditions of excessive scaling. Sealing is accomplished by the use of an "O" ring of Buna "N" synthetic compound. An important feature of the design is the elimination of bellows. As a result, the thermostats are relatively insensitive to pressure. This means that they can be installed right in the pressureized lube oil lines where they will function to control temperatures accurately as their calibration is not affected by pressure or pressure fluctuations.

The principle of operation is simple. One opening (A)

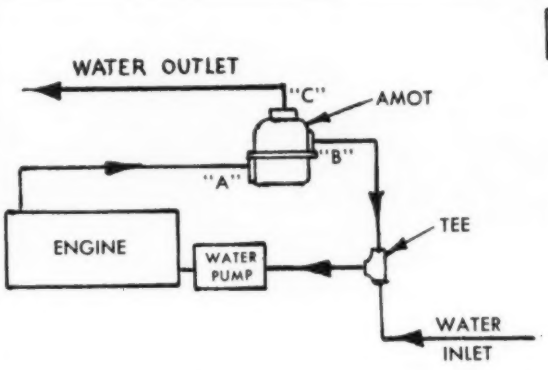


Fig. 3. Installation of the thermostat in a system where only raw water is used. Recirculating feature, when cold, speeds engine warm-up and later tempers the raw water temperature.

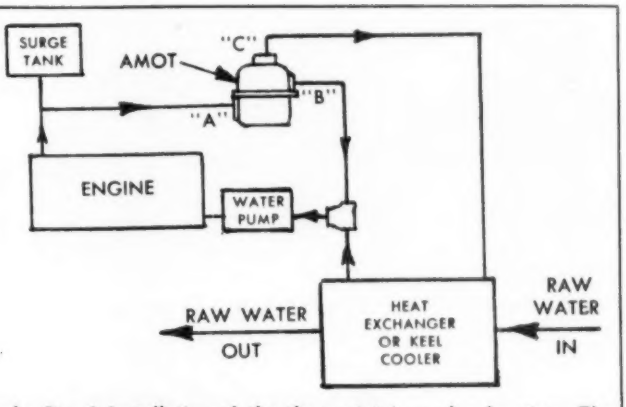


Fig. 4 Installation of the thermostat in a closed system. The same warm-up feature is provided. With the use of a heat exchanger, treated water can be used in the closed cooling system.

always remains fully open. The internal temperature-sensitive element positions a sliding valve to block either of the other openings (B or C) or to proportion the flow between them. When cold, opening (C) is fully closed and opening (B) wide open. When at maximum temperature the relative situations are reversed.

With the functions of the different openings clearly in mind, it is possible to devise many different hookups to achieve the desired results. The method of use will depend upon the system to be used. Basically, the thermostat will act either as an automatic proportioning bypass valve or as a blender. Examples of different systems for both cooling water and lube temperature control are shown.

The advantages of accurate temperature control are numerous and should be fully realized. It is important to recognize that cold operation can be as harmful as excessively high temperatures. If temperatures become extremely high, rapid and severe damage can occur to an engine. However, this condition is relatively easy to detect through normal instrumentation and steps taken to correct the condition.

Low temperature is more subtle in doing its dirty work. Although an engine temperature gauge may indicate a low temperature, there may be a lack of appreciation of the damage being done. For one thing, the engine is never dimensionally stable unless it is up to the manufacturer's recommended operating range. Condensation within the engine is increased and sludge builds up rapidly, acids tend to form and the lube oil is soon unsuitable or unable to do its job. Then wear rates increase and before long the engine needs an overhaul.

In the long run it is much cheaper to provide a means for maintaining proper lube oil and cooling water temperature. Operation will be better and cheaper, there will be fewer repair bills, and the engine will last longer.

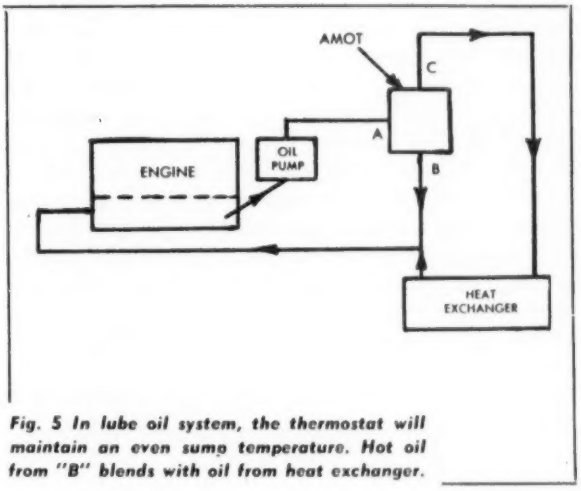


Fig. 5 In lube oil system, the thermostat will maintain an even sump temperature. Hot oil from "B" blends with oil from heat exchanger.

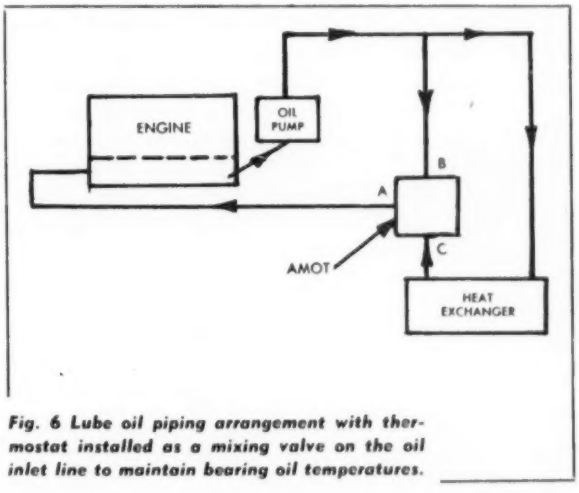


Fig. 6 Lube oil piping arrangement with thermostat installed as a mixing valve on the oil inlet line to maintain bearing oil temperatures.

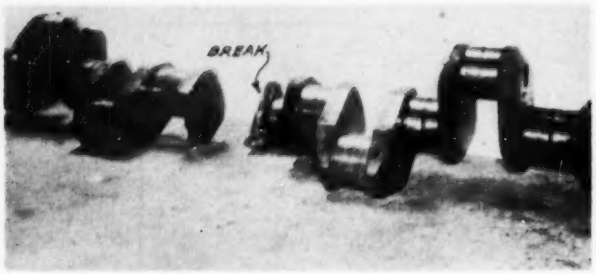


Fig. 1 A crank web failure resulting from bearing misalignment.

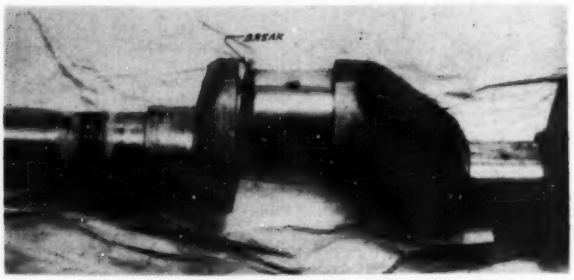


Fig. 2 Here, excessive bending strains were the main cause.

Avoid Crankshaft Failures*

If you are going to prevent crankshaft failures, you have to know what to look for. Here are a few ideas to help you avoid trouble.

CRANKSHAFT failures are expensive and represent a major accident. To help avoid such accidents, where possible, it is necessary to have some knowledge of the causes, and the methods of crankshaft inspection. Usually, the failure is the final result of a crack that has progressed through the shaft body over an appreciable length of time. It is also possible for a crankshaft to be broken or twisted off instantaneously, without prior weakening by a progressive crank, but such cases are not common.

Progressive cracks are the result of excessive stresses produced by bending or torsion strains. These strains may arise from a variety of causes such as: bending action due to bearing misalignment, excessive belt tension, or the weight of a heavy, overhung flywheel; torsional vibration; faulty design of the crankshaft itself, or its application; or internal defects in the forging or casting of the shaft.

Bending Strains

A good example of what can happen to a diesel crankshaft when bending strains become excessive, is shown in Fig. 1. This break was due to stresses imposed by misaligned bearings. Continued operation under excessive stresses caused the propagation of a crack through one of the webs, finally resulting in the parting of the shaft at that point. Breakage across a crank web may have its origin in one of the fillets of a crank throw as in Fig. 1, or in a fillet at a main journal. Generous fillets at these points are a desirable safeguard against the starting of cracks and ultimate breakage of crank webs.

Although the majority of crankshaft failures resulting from bending strains take place at the crank webs, there have been instances where failure occurred in the crankpin. Such is the case of the shaft shown in Fig. 2.

Where a failure resulting from bending strains occurs, the surface of the break will have a characteristic appearance. This will be noted from the broken crankpin in Fig. 3. The rather smooth portions of the break indicate periods of relatively slow cracking in the earlier stages of failure. As the shaft weakened, the rate of cracking increased, thus producing a rougher surface. Finally, sudden failure and complete separation occurred, producing the jagged area shown at the bottom in the illustration.

Torsion Strains

Crankshaft failures resulting from excessive torsion strains take a different form than those caused by bending strains. Illustrated in Fig. 4 is a typical torsion failure of a diesel crankshaft. It will be noted from the illustration that the crack in this case progressed through the shaft in

Fig. 3 Surface appearance of a crankpin which failed due to excessive bending strains. Note smooth and rough surfaces.

**Abstract of an article by The Hartford Steam Boiler Inspection and Insurance Company, published in a recent issue of The Locomotive.*

the shape of a helix. This is in contrast to cracks caused by bending strains which would run at right angles to the shaft axis as shown in preceding illustrations.

In Fig. 5 the helical shape of a progressive crack resulting from torsion strains can be seen. This crack in a diesel crankpin was disclosed by a whitewash test before complete breakage occurred. Had this crack gone unnoticed, and the shaft returned to service, the engine might have suffered a crankshaft failure. This illustration clearly shows why crankshaft inspection procedures must be carefully followed.

Inherent Defects

Occasionally, shaft failures are the result of some unfavorable factor in the material or design of the shaft or engine. However, shaft breakage due to internal defects in the forging or casting of a crankshaft figure rather infrequently as a cause. One such case is illustrated in Fig. 6. The cross section of the broken crank web was 4½ in. by 10 in. The shaft had been in the engine only a short time when the crank web broke as a result of a cold-shut in the material.

The crankshaft in Fig. 7 was broken as a result of torsional vibration in a 6-cyl diesel engine. It will be noted that the break occurred in a coupling flange located midway of the shaft, there being three crank throws on either side. This typical torsional vibration failure was reportedly caused by operation of the engine at a critical speed. In other words, a speed at which two opposing oscillating masses produced a vibration node located in the coupling where the failure occurred.

It can be said that failures originating in the design or materials used for crankshafts are greatly in the minority. Breakages usually result from unfavorable operating conditions or misapplication. Such failures are largely preventable by proper maintenance of bearings, belt tension and other factors affecting shaft alignment.

Shaft Inspection

Crankshaft inspections include examination for cracks that will lead to shaft breakage and other damage to the machine. One test that has been used for many years to detect cracks in metal objects is the "whitewash test". In making this test the suspected area is first washed with kerosene copiously applied with a brush or rag.

The kerosene is permitted to remain on the area for a length of time sufficient for it to creep into any crack that may exist. (Penetrating oil mixed with the kerosene aids capillary action necessary to carry the kerosene into a fine crack.) The shaft is wiped dry after a time and a mixture of chalk powder and diluted alcohol is brushed on and allowed to dry. If a crack exists it will show up as a oily streak in the chalk coating. Several hours may be required to disclose a fine crack.

An improvement on the whitewash method is a somewhat similar test in which a mixture of light fuel oil, cutting oil and red dye is used. This is applied to the suspected area and allowed to remain there for a few minutes. The mixture is then thoroughly removed by wiping the part with a dry cloth or one moistened with cleaning fluid. The area is then dusted with talcum powder. If a crack exists it will quickly appear as a red line on the white talcum coating.

Another effective test for detecting cracks in machine parts is the Magnaflux test, now used by HSB inspectors. In this test the part to be inspected is subjected to a magnetic field. Then, specially prepared particles of finely-divided iron are blown onto the part and, due to magnetic attraction, will arrange themselves in a line along any crack that may exist. Fig. 8 shows a crack discovered in a crank web of the shaft of an ammonia compressor by means of the Magnaflux test.

HSB Straingage

The HSB Straingage, Fig. 9, provides one means of making an important test for excessive bending strains. The gauge, or dial micrometer, was developed by the Company for the purpose of measuring the amount of strain or deformation that occurs in the crank webs with each revolution of the shaft.

When the amount of strain in the crank webs is known,

Fig. 4 A diesel engine crankshaft that broke as a result of torsion strains.

←

Fig. 5 A helical crack in a diesel crankshaft disclosed by use of the whitewash test.

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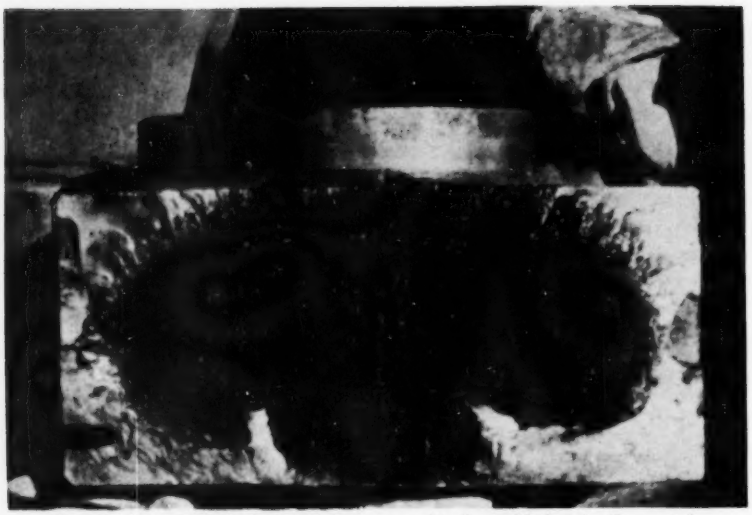


Fig. 6 A crank web that failed as a result of a cold-shut in the metal.

Fig. 7 Torsional vibration caused the failure of this diesel shaft coupling.

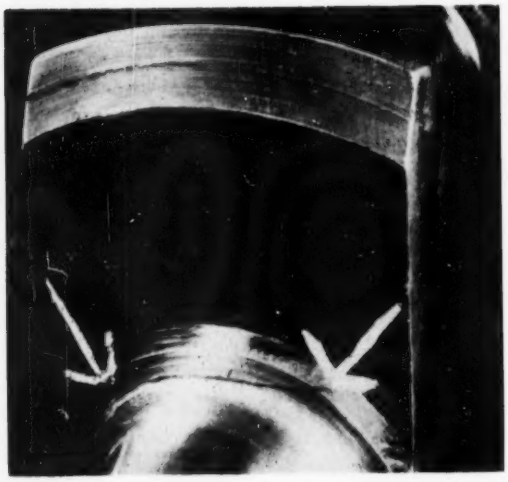


Fig. 8 Here, the magnaflux test discloses a cracked web.

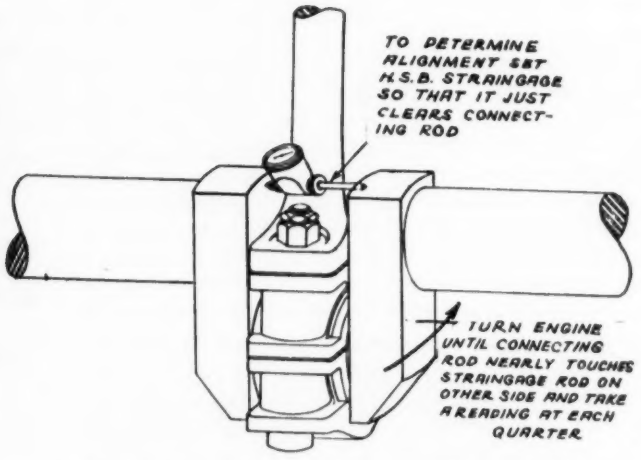

TO DETERMINE ALIGNMENT SET K.S.B. STRAINGAGE SO THAT IT JUST CLEARS CONNECTING ROD
TURN ENGINE UNTIL CONNECTING ROD NEARLY TOUCHES STRAINGAGE ROD ON OTHER SIDE AND TAKE A READING AT EACH QUARTER

Fig. 9 One method of checking crankshaft deflection.

the measurement can be used to compute the resulting internal stress in the webs because, according to Hooke's Law, the stress is directly proportional to the strain, within the limit of proportionality of steel.

In the 30 years since the development of the Straingage, it has been instrumental in disclosing conditions of excessive stress, and in preventing shaft breakage in a great many engines and compressors.

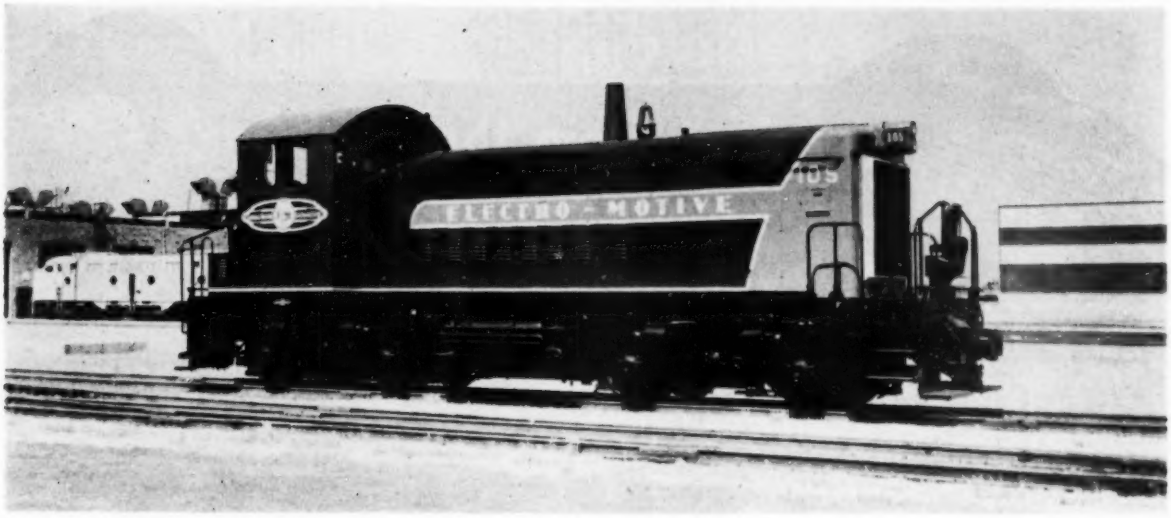
Summary

It might be well to point out again that crankshaft failures can, to a large extent, be prevented by proper operation and maintenance procedures. The frequency with which crankshaft inspections take place should be dictated by previous operating experiences and manufacturer's recommendations.

Perhaps the simplest method of inspection is to slowly rotate the shaft. A perfectly aligned shaft will turn freely, while a misaligned shaft will bind. However, this is only a quick method of checking. It should not be used in place of periodic inspection with a strain gauge. Bearing clearances must also be checked. If bearings are too tight, chances are they will fail prematurely and possibly cause serious damage to the shaft. On the other hand, excessive bearing clearance may permit shaft deflection, resulting in a failure.

At times of general overhaul, both shaft and bearings should be thoroughly inspected. Frequently, a careful inspection of the bearings will indicate whether trouble is developing and what corrective measures should be taken.

If torsional strains are to be prevented from becoming excessive, operation in critical speed ranges for extended periods must be eliminated. Common indications of this are vibration and roughness of operation. In some cases, this is not a job for the operator alone since with the addition of driven equipment the system's frequency may become such that design changes must be made. However, these instances are few and far between in well-engineered installations.



EMD'S Hydraulic Switcher

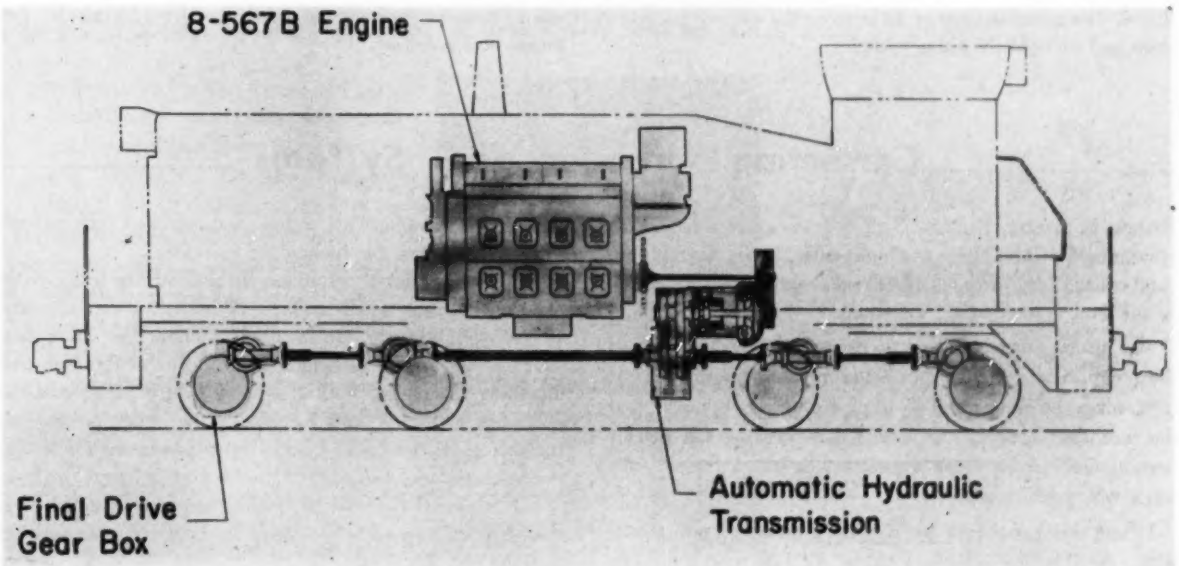
WHAT is the practical horsepower limit for automatic transmissions? No one can say for sure. The Electro-Motive Division of General Motors has pushed the frontier further in American practice by introducing an 800-hp switcher in which the engine's power is transmitted to the drivers through a torque converter supplemented by a 3-speed automatic shift.

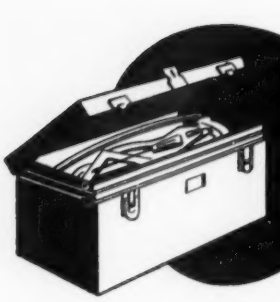
Billed as "the most powerful application to date of an automatic transmission in a moving vehicle in the United States", the switcher was exhibited at the Quinquennial convention of the Railway Supply Manufacturers Association at Atlantic City, New Jersey, June 22-27.

Power is provided by EMD's 8-567B engine. The transmission is an Allison Division of General Motors unit, just developed for use in standard as well as narrow gauge railroad locomotives. Hydraulic torque multiplication plus the supplemental 3-speed automatic shift matches engine power to locomotive power requirements, automatically.

Maximum full load speed of the switching locomotive is 40 mph. It will also produce a continuous tractive effort of 57,000 lb at 2.6 mph.

In addition to the switcher, one of the 800-hp rated Allison torque converters, along with earlier automatic transmissions developed by other GM divisions for automotive use, were on display at the GM permanent exhibit located on the Steel Pier.





Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

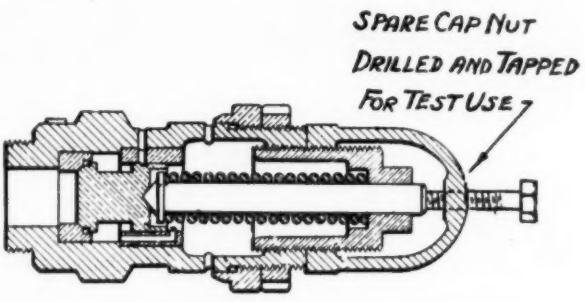
Speeding Up Safety Value Testing

C. E. Tucker, Peoria, Illinois—On our diesel switchers there are two safety valves on the air main reservoir system. The compressor governor unloads at 130 psi and the first or low-pressure pop goes off at 135 psi. The high-pressure pop operates at 150 psi.

Now, when the "G" man (Federal Inspector) comes around, we must demonstrate to his satisfaction that these pop-valves operate as they should when the governor control is cut out. So as to avoid having to adjust the low-pressure pop-valve after test, we have been taking the valve out of the fitting after it had been tested and use a plug in the opening so as to test the high-pressure pop-valve. To do this, the engine had to be stopped and the air pressure blown off.

Then after the high-pressure pop-valve had been tested, the engine was again stopped, air blown off, and the low-pressure pop-valve replaced. When the air pressure had been pumped up again, the locomotive was ready to go.

This was a cumbersome way to avoid the necessity to readjust the low-pressure pop-valve, so we worked out a scheme that was better than either of the other methods. Since all of the low-pressure pops were of the same type, we took a spare cap nut and drilled and tapped it for a screw. The screw is located to bear on the end of the valve stem and so hold the valve seated.



When the pressure was increased sufficiently it would lift the high-pressure pop and the "G" man was satisfied. Then all that we had to do was to replace the test cap and nut with the valve's regular cap nut and the whole test was finished without having to stop the compressor or to blow off the air reservoir.

Sounds like a good practical stunt. We'll bet that it has another advantage over removal and replacement of the valve—the threads last longer and there is less possibility of leakage. While the cap nut idea is probably the best, we wonder if the adjustment of the low-pressure pop would not be simpler than the removal rigamarole. However, you know best.—Editor.

Correcting Airbound Fuel Systems

Joseph P. Reddy, Hollis, N. Y.—I work for a large bus system using GMC buses predominantly. When working on road calls, a large majority of breakdowns were simply due to the fuel system being airbound.

The usual procedure was to remove the secondary fuel filter cap, add some fuel oil, and replace the cap. After tightening, the cap's small $\frac{1}{8}$-in pipe plug was removed and the mechanic blew in the hole while pressing the starter button. Aside from being unsanitary, a lot of unnecessary work was performed.

I beat this procedure by rigging a small bicycle pump with a flexible line and check valve. All I do now is remove the pipe plug and with a few pumpstrokes, get enough pressure to carry the fuel to the injectors.

It is also a quick check to see if the filter cap leaks. After putting the filter under pressure, I listen for escaping air. In the shop, the rig can be used to check the whole fuel system for leaks by disconnecting the line at the tank and attaching the pump. With a small pressure gauge and the necessary fittings, I start by putting the gauge on the line furthest from the tank. I build up pressure and if it will not hold, I work back toward the tank until I find the leak.

Sometimes the standpipe in the tank may leak, so it is always good to check this point first before going ahead with the rest of the job.

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WAUKESHA 135 Series

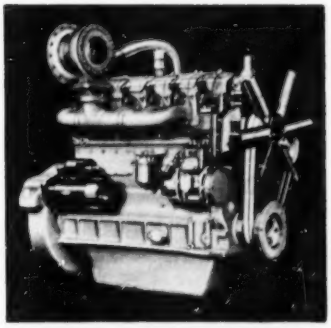
426 and 451 cu. in.

•

147 to 185 max. hp

Diesel or Gasoline ENGINES

● Waukesha 135 Engines are ideal for almost any service in their speed and power range. Gasoline versions are 426 and 451 cubic inch displacement; Diesels are 426 cubic inch, normal or turbocharged. Counterbalanced crankshafts, aluminum pistons, full pressure oiling—every modern feature! Exceptionally rugged, smooth, and lively. For medium speed industrial service these engines are available with standard crankshafts. Send for bulletins.



135-DKBS—TURBOCHARGED DIESEL
Maximum hp 185 @ 2800 rpm.

213

WAUKESHA

Diesels

13 hp to 570 hp

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
New York • Tulsa • Los Angeles

PRODUCT

Diesel-Powered Lift Truck

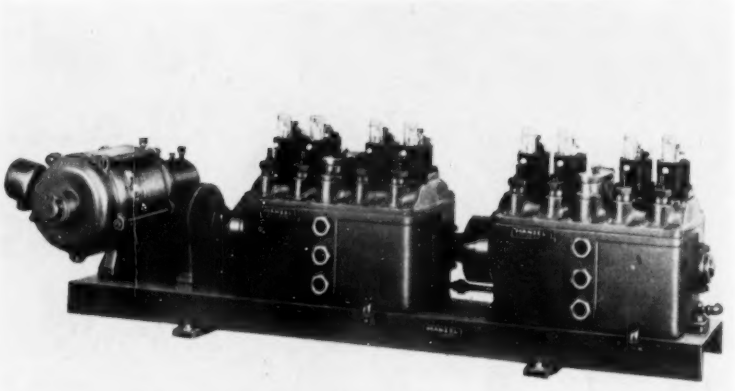
Among the recent additions to The Buda Company's line is the Model FTPD60-24 diesel-powered fork lift truck. These pneumatic-tired units, available with single or dual drive wheels, have a load capacity of 6000 lb at a 24-in load center and are available in standard lift height of 72, 84, 108, 114 and 120 inches.

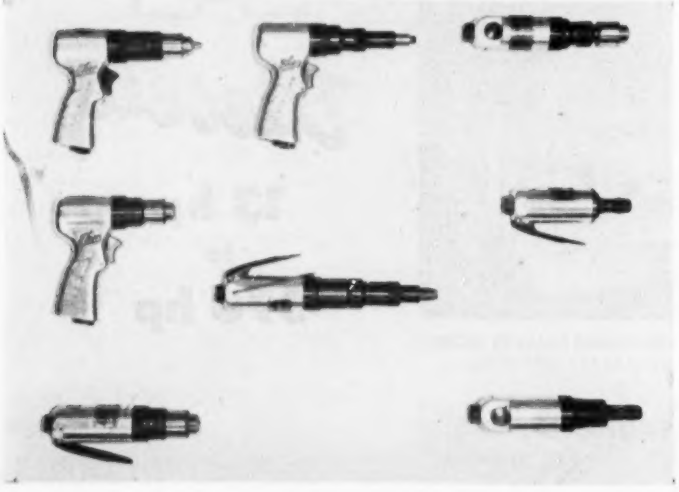
Power for this fork lift unit is supplied by a Model 6B6-230 Buda diesel. Torque converters are available as optional equipment for all fork lift models. Overall length, less forks, is 104¾ in for dual drive trucks, and 106¼ in for single drive units. Details are available from The Buda Company, Harvey, Illinois.

Lubricators

High pressure force feed lubricators, designed for service at up to 30,000 lb, have been announced by the Manzel Division of Frontier Industries Inc., Buffalo, New York.

The lubricators consists of four integral sight feed and pump assemblies mounted on a cast iron reservoir. They are directly connected to a gear motor and attached to a rigid base. Pumping rate is easily controlled by fingertip adjustment. Heaters are easily incorporated.





Air-Powered Tools

A line of light-weight pneumatic drills, screw drivers, nut setters, and grinders, has been announced by the Thor Power Tool Company. There are 85 different sizes that have been restyled to provide light weight and long life. Units range in weight from a grinder weighing 1 lb, 1 oz to an angle screw driver weighing 2 lb, 11 oz.

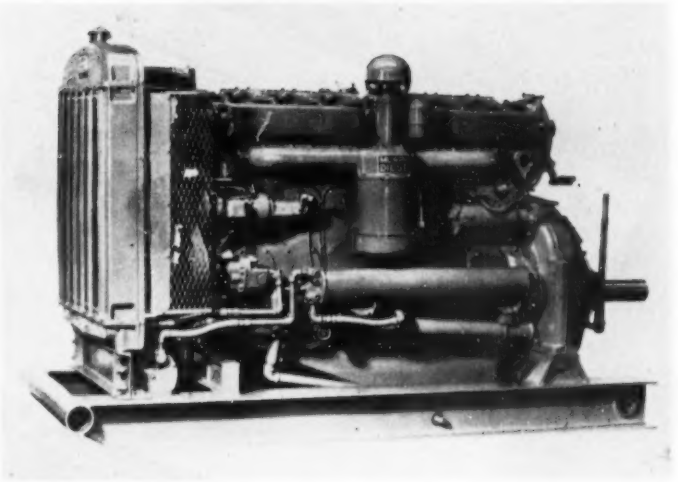
Drills are featured in 31 sizes, including a choice of straight or pistol grip, button or lever throttle. Screw drivers and nut setters come in 48 sizes, 28 of which are angle types. Angle drive attachments are also available for drills. Additional information is available from the company at 330 W. 42nd St., New York, N.Y.

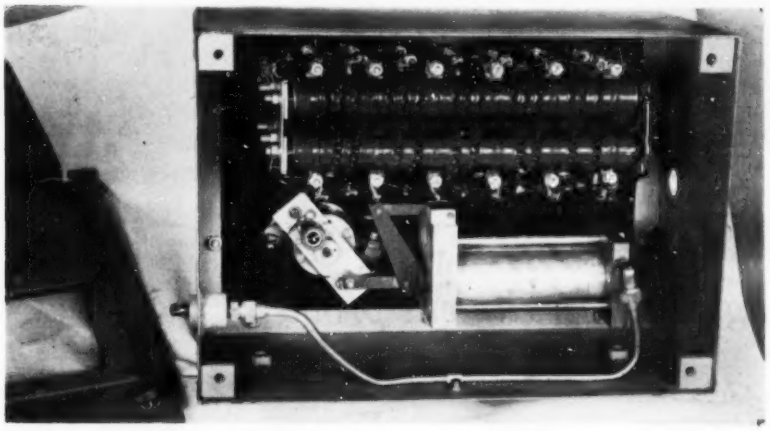
PREVIEW

Murphy Ups HP Range

With the addition of four models, the power range of Murphy diesel engines has been extended upward. Bore and stroke for the four models are 6⅜ in by 6½ in, respectively. The Model 24 is rated at 185 hp for continuous service and 200 hp for intermittent duty. Model 124 has a continuous rating of 210 hp and 225 hp for intermittent service. Ratings for the Model 224 are 200 hp and 215 hp, respectively, for continuous and intermittent service. Model 324 is rated 225 hp continuous, and 240 hp intermittent.

Models 24 and 124 are designed to operate at 1200 rpm, while Models 224 and 324 are designed for operation at 1400 rpm.





Load Regulator

An improved load control regulator for diesel-electric locomotives has been introduced by the Westinghouse Electric Corporation. The Commustat regulator, as it is known, is designed to insure constant loading of the diesel engine over the normal range of operating speeds and match generator output to the power the engine can produce.

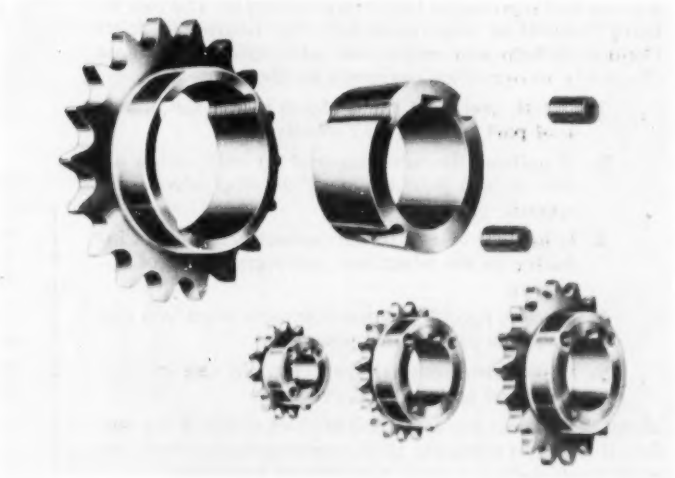
For further information, write the Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.

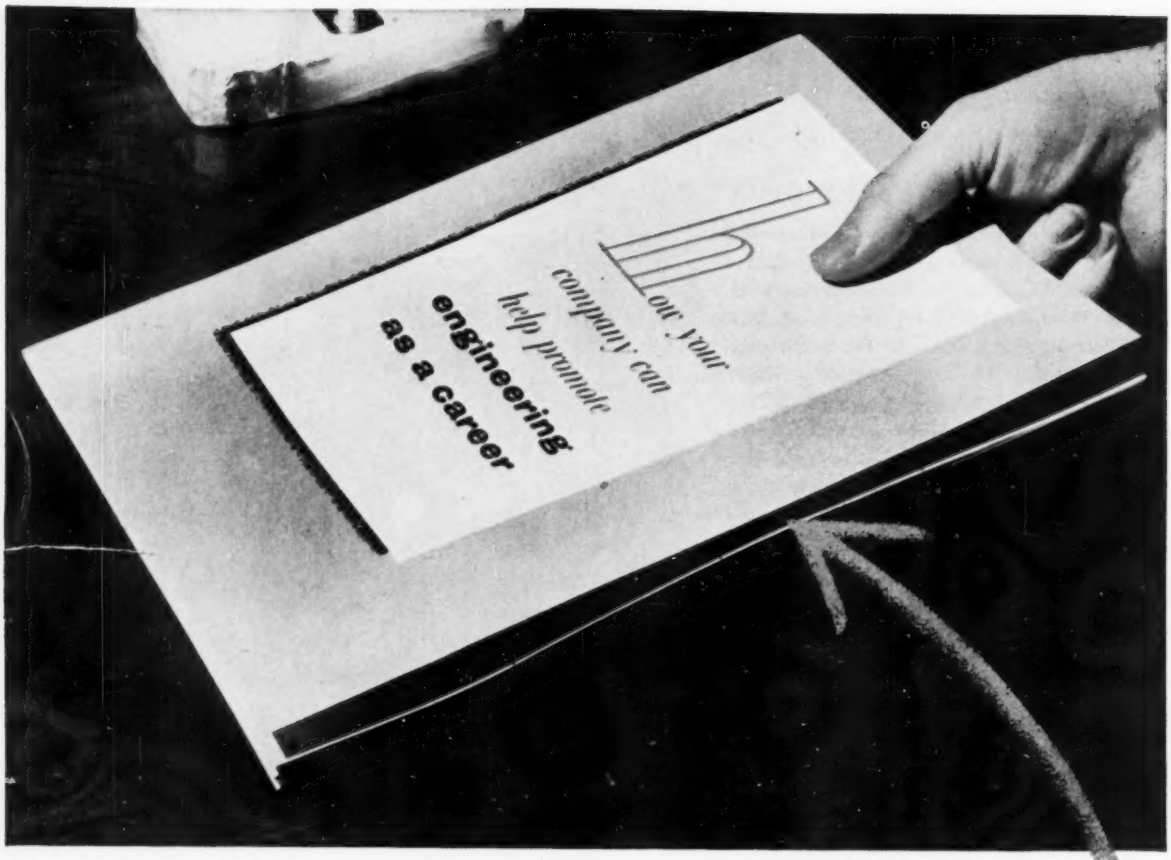
Taper-Lock Sprockets

Morse Chain Company, a Borg Warner Industry, recently announced a line of stock roller chain spockets as an addition to its present line of stock plain bore sprockets.

Sprockets are designed to meet the requirements of most industrial applications while eliminating the delay and extra expense of reboring to fit shafts. The sprockets are keyed to shafts for ease of installation and removal, yet firmly grip the shaft.

The sprockets are also designed to fit any roller chain manufactured to American Standards, No. 40 through No. 100. Additional information is available from the Morse Chain Company, 7601 Central Avenue, Detroit 10, Mich.





HERE'S HELP

for your engineer-recruitment problem

Engineers' Joint Council and The Advertising Council offer free, expert help to advertisers promoting engineering as a career.

The booklet reproduced here was prepared by The Advertising Council in cooperation with the Engineers' Joint Council to help you make your advertising work most effectively in recruiting engineers for the future.

1. It tells you what the problem is and the important part you can play in solving it.
2. It outlines the advantages of an engineering career to help your company develop advertising appeals.
3. It informs you as to the current activities of industry in the education and recruitment of engineers.
4. It offers specific suggestions as to what you can do (from present manpower).
5. It provides material that you can use in your own local and national programs.

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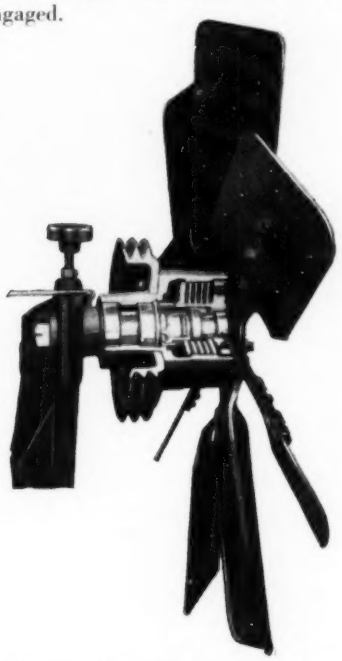
Thermatic Fan Drive

Schwitzer Cummins Co., 1125 Massachusetts Ave., Indianapolis 7, Ind., announces its new thermatic fan drive, to regulate the cooling of heavy duty engines.

The device operates on simple principles; a built-in multiple disc clutch, normally engaged by spring pressure, turns the fan with a pulley. When cooling is not required, hydraulic or pneumatic pressure which is regulated by a thermostatic control valve automatically disengages the fan. Advantages claimed are fuel savings up to 10 per cent and increased hp output up to 10 per cent when fan is disengaged.



Additional features are interchangeability with present constant fan drive making use of standard fan, pulley, and bracket; simple installation; automatic fan engagement in case of loss of actuating pressure; and, actuating force for fan control can be either engine oil pressure or air pressure from the system.

Brush Shunt Cable

National Carbon Co., a division of Union Carbide & Carbon Corp., 30 E. 42 St., New York 17, N. Y., has developed a fray-resisting shunt cable known as Type FP, for diesel-electric traction motor brushes which is claimed to have longer fatigue life and to reduce cable failures.

Tire Repair Gun

Gates Rubber Co., 999 S. Broadway, Denver 17, Colo., is manufacturing a tire gun which makes possible the repair of flat tires without need for removing tire from wheel. Permanent repair is said to be possible with the vulcanizing compound released by the gun which seals punctures and allows for immediate service.

Recommended for repair on every type of tire, the gun is claimed to be of particular value for repair of tubeless tires since special equipment and training is eliminated. The rubber compound, despite its quick-sealing properties, will not harden in the gun because of air-tight protective caps, and each gun contains enough compound for repair of 20 ordinary tires or 50 tubeless tires.

Audio-Video Elec-Detec

As a practical help in maintenance, testing and inspection, Anco Instrument Div., American Name Plate & Mfg. Co., 4254 W. Arthington St., Chicago 24, Ill., has introduced an

ELIMINATE

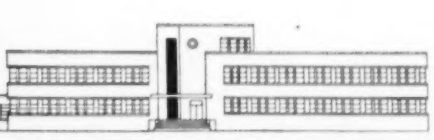
costly repairs on your engines

PENN Safety Controls prevent little troubles in engine lubricating and cooling systems from growing into major engine breakdowns with their attendant costly repairs. Here's how it's done . . .

If water temperature rises too high or if oil pressure drops too low . . . the PENN Safety Control swings into action. Automatically it sounds an alarm, flashes a warning light or stops engine operation . . . whichever you choose. Then, the fault can be investigated and corrected before serious damage develops.

Learn more about this low-cost protection for your engines. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

In romantic, historic Taos, New Mexico, trouble-free power service is vitally important. For that reason the Kit Carson REA plant uses three Nugent Duplex Fuel Oil Filters to protect and prolong the life of its three 960 H.P. Diesel Engines. These heavy-duty diesels generate power for all of Taos County, part of Colfax and Arriba Counties and parts of southern Colorado. A break-down in the system would affect 24,000 people including a group of Taos Citizens who drive to work each day at the Los Alamos Atomic Research Center 60 miles away.

Above: Nugent Duplex Filter—the type used to filter fuel oil for the Kit Carson REA plant, Taos, New Mexico

Wherever engines must give long dependable service, Nugent filtering provides the type of protection that is essential. Offering more effective filtering at lower cost, Nugent filters are available in a complete range of sizes and types to meet every need. They utilize inexpensive bag-type cartridges having 20 times the filtering area of other filters of comparable size. Write for full data, outlining your filtering requirements.

Wm. W. Nugent & Co., Inc.
417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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audio-video model of the Elec-Detec, a portable electronic instrument for locating noise sources in all types of mechanical equipment.

The unit, known as Elec-Detec Model V, includes a milliammeter for visually checking sound impulses in addition to standard headphones. The combination enables the operator to "see as well as hear" source of trouble in moving parts such as bearings, pistons, gears, cams, etc.

Oil Filter Cartridge

Nash Finch Co., 1754 Hennepin Ave., Minneapolis 3, Minn., announces a new diesel oil filter cartridge being sold directly to railroads through brokers in principal cities. The cartridges are uniform in size and design and are said to be easy to install and remove.

Outer covering is of fine mesh cotton, and heavy fine mesh tubing covering center tube acts as an additional filtering agent. Cotton thread waste of even density equalizes filtering while reinforced steel center tube has free flow perforations for maximum efficiency. A two-way gasket seals out oil by seating and squeeze action said to eliminate oil by-pass.

Tiny Parts Cabinet

Precision Equipment Co., 3714 Milwaukee Ave., Chicago 41, Ill., announces production of an all-steel "Little Gem" tiny parts cabinet for small parts storage. The units consist of two 1½-in high drawers in a one-piece welded frame having an overall size of 3¼ by 11 by 11 in.

Each drawer is furnished with eight dividers, giving the cabinet a total of 24 adjustable compartments. Extra dividers may be added. Tabs turn up and engage shelf above to prevent tipping when used as an insert in shelving, and any number of units may be stacked in one solid assembly. They are priced at $8.90 each with extra dividers available at 8 cents each.

Lube Oil Analysis Eliminates Ashing

Lubricating oils used in diesel locomotives can now be analyzed for metallic contaminants with speed and accuracy using spectrographic equipment employing the direct-sparking Rotrode technique developed by Ap-

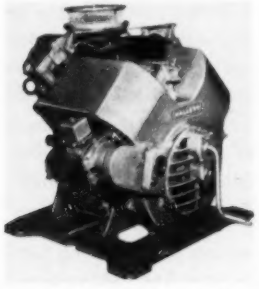
plied Research Laboratories, 3717 Park Pl., Glendale 3, Cal., it is announced. The new method eliminates the time-consuming and costly ashing technique formerly used, according to company technicians. As a direct result of this development, one large railway has reportedly purchased an ARL production control quantometer installation for use with the Rotrode method.

As is known, the presence of certain contaminants in used lube oils is indicative of wear on specific components in the engine. Spectrographic equipment has been used successfully to obtain data which correlates amount and rapidity of wear with the concentration and change in concentration of the contaminants. However, concentrations have been found to be low and methods of sample preparation expensive. Ashing techniques have generally been used which require large amounts of oil sample and a great many man-hours before suitable spectrographic samples and standards could be obtained.

The Rotrode technique is said to permit satisfactory analysis of lube oils without use of this ashing method. Routine analysis is claimed to be practical, fast, and comparatively low in cost, and also extremely accurate. A detailed report of the method may be obtained by writing the company.

New Hallett Diesel

Hallett Mfg. Co., Inglewood, Cal., announces that it is currently in production on a new 2-cyl, air-cooled diesel engine designated as Model AC-2.



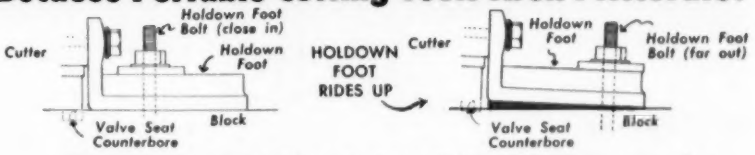
Of 4-stroke cycle, the engine is air cooled with integral flywheel. It develops 13 hp at continuous load and 14 hp at intermittent speed. Of $3\frac{1}{2}$-in bore and $3\frac{3}{4}$-in stroke, it has 36.07 cu in displacement per cyl and a

MAINTENANCE REPORT

Why Are Replacement Valve Seats .008 or .010 Oversize?

(WHEN FACTORY REQUIREMENTS ARE ONLY .004)

Because Portable Cutting Tools Aren't Accurate!



When the cutter is fed down, the foot will lift slightly even on the best equipment. If the bolt through the Holdown Foot is close to the fulcrum, a *fairly* accurate hole is made. The hole becomes larger *and tapered* when the bolt is moved farther from the fulcrum.

In use, the bolt position may change two or three times on the same cylinder head or block, and holes may vary from .001 to .006. This means that press fit interference varies from .002 to .010. The result is excessive press fit, which causes valve port cracks and distorted, cocked seats, which causes valve burning and breakage.

PETERSON'S

SCREW-IN VALVE SEAT

Eliminates the problem of counterbore accuracy!

Even the heavy-duty P-B Holdown Foot allows oversize cuts, but it doesn't matter BECAUSE THE COUNTERBORE IS THREADED. P-B seats exert no radial pressure—even under extreme heat—due to clearance in threads. They eliminate cracks in valve ports common to some engines. P-B seats will stay round, where pressed seat (especially with excessive interference) distorts quickly. This causes valve failure. P-B gives 2 or 3 times longer valve life, since it cools the valve evenly around the head, where 75% of the heat should be dissipated. Distorted pressed-seat doesn't cool valve. The valve stem grows and sticks in guide. Cocked pressed-seat definitely causes most broken valves.

NORMALIZED

Under heat, it expands outward and slightly downward, becoming tighter.

HEAT-TREATED

Made of tough chrome-nickel-iron, individually cast under pressure. Unlike pressed-in seats, P-B Screw-In Valve Seats retain their original dimensions, won't buckle and come loose, can't tilt and cause hot spots and valve burning, and allow for perfect seating of valve on every stroke.

Mechanics say pressed-in seats look like this before they start grinding.

AMAZING PERFORMANCE

- **SAVES COSTLY BREAKDOWNS**—Eliminates 75% of valve burning, sticking, and breakage. Also eliminates 75% of valve port cracks due to radial pressure of expanding pressed-in seats—or valve port cracks in many heads where no seats are used.
- **REPLACE MANY TIMES**—You can replace P-B seats without damaging the threads in counterbore or going to an oversize.
- **NEW-ENGINE VALVE MILEAGE**—And the seat remains tight in the counterbore.
- **EASY TO REGRIND**—After long service just a light touch with the grinding stone cleans it up because it is not out of round.

PRECISION INSTALLATION EQUIPMENT

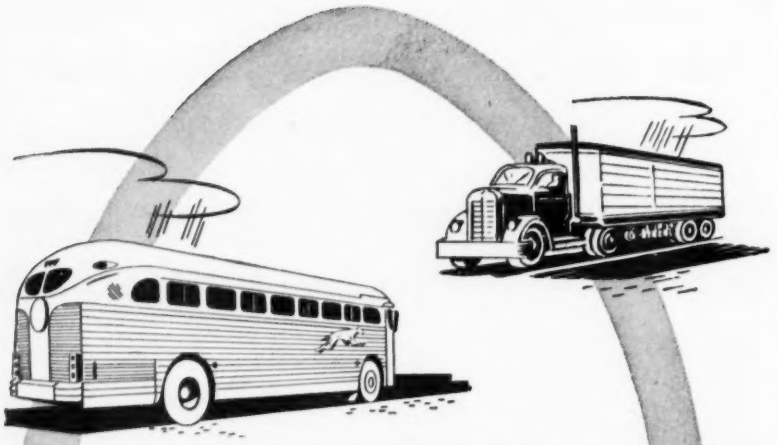
Patented tooling guarantees threads square with bottom of counterbore, thus insuring self-locking feature.

Special CUTTER makes precision counterbore and tap machines in expansion clearance between thread.

CONTACT YOUR MASTER SHOP TODAY

P-B Master shops are ready to help you solve your valve maintenance problems in every major U. S. city. Call him, or write direct.

PETERSON WELDING LABS. INC.



...for more efficient FUEL HANDLING use....

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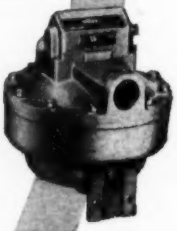
• Bowser is the pioneer and foremost builder of fuel-handling equipment. Whether it is a single dispensing pump or a complete high-speed fueling system, Bowser can supply the exact equipment to meet your needs and will assume full responsibility to assure you complete satisfaction.

metering

The heart of your "cost control" should be a Bowser XACTO meter. These "sealer approved" meters will accurately check fuel oil receipts, record dispensing and provide consumption data on all units.



filtering

Chances of clogged injectors and undue engine wear are minimized with Bowser Micro-Filtered fuel. Watch downtime and maintenance costs drop when your fuel is Bowser-filtered.

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20 to 1 compression ratio. Weight of the engine is 25 lb per hp. A folder is available on request.

Fiber Disc Recharge

An expendable, laminated fiber disc recharge with "four to ten times the useful life of cellulose, waste or redwood" has been designed by Wm. W. Nugent & Co., Inc., 410-412 N. Hermitage Ave., Chicago, Ill., for the full flow filtering of large quantities of oil. It is classed as an extended area recharge because its actual filtering area is greater than its container area.

In a recent test on a 1000-hp supercharged diesel engine at an oil company's pipeline station, the new recharges are said to have kept the oil cleaner (0.02 per cent by volume) for 3500 engine hours. The laminated discs remove solids smaller than 2 microns and the absorption of these solids after 48 hours of draining at 70°F is said to be 2½ times the weight of the recharge. No chemicals, bleaches or diatomaceous earths are used and the units will therefore not remove vital additives from detergent oils.

Safe Voltage Tester

Ideal Industries, Inc., 4271 Park Ave., Sycamore, Ill., announces a new voltage tester which will show nominal line voltages from 110 to 550 AC and 110 to 600 DC, as well as distinguish between AC and DC and show polarity of DC lines.

Designed for a high margin of safety, the tester incorporates prod handles that are integrally molded to Neoprene insulated leads and include tip insulation and safety rings. The plastic case is completely enclosed to keep out foreign matter and moisture and there is no exposed metal on the exterior of the case to carry current from working parts. Coil leads have been isolated to avoid cross-overs and shorts. A neon lamp in parallel with the solenoid provides double check on circuits.

Flame Cutting Equipment

Milwaukee Shipbuilding Corp., 3718 W. Lancaster Ave., Milwaukee 9, Wis., has placed on the market a "three-dimensional" flame cutting unit for scarfing the edges of curved metal pieces in preparation for welded assembly of larger units.

Originally developed for the armed

forces, the method is said to open the door to increasing strength in curved metal structures made up of welded parts which themselves are curved. The semi-automatic equipment, powered by a 1/25-hp motor, speeds up and makes more uniform the preparation of welding joints in comparison with hand-held flame torch methods of scarfing curved pieces.

The equipment is called three-dimensional because it operates vertically, horizontally, and around curves. It centers on a flame cutter which moves under power, slanting at a constant angle from the desired apex of a scarfed edge. A system of twin rails matches the turn of the metal under process.

Pneumatic Lubricator

Air-Speed Tool Co., 1502 W. Slauson Ave., Los Angeles 47, Cal., is marketing a new oiler for automatically lubricating pneumatic tools and at the same time filtering the line. Tradenamed the Air-Speed Williams Pneumatic Lubricator, it features lightweight Neoprene O-ring mountings to permit dragging with the hose without damage of marring and a non-breakable window to show when oil supply

needs replenishing. Any good oil up to SAE 30 may be used, and fittings are adaptable to all standard size air lines. The device may also be used on a stationary machine line.

The new lubricator has no moving working parts but the oil flow can be regulated by a needle-point adjustment. Air bypasses the feeder outlet so that the line does not have to be shut down to refill. Filter section may be easily cleaned by air. The device can also be supplied without the filter element.

Small Size Temperature Control

A new small size temperature control between the limits of plus and minus 300°F is being produced by the Burling Instrument Co., 5 Vose Ave., South Orange, N. J. It operates on the prin-

Sharples

CONTINUOUS CENTRIFUGAL OIL PURIFIERS

Pay Their Way

LUBRICATING OILS—Sharples Purifiers remove water, tank scale, carbon sludge and other impurities *without harming or removing protective additives.*

LIGHT FUEL OILS—Impurities such as dirt, tank scale and water are readily eliminated by Sharples Purifiers at low cost.

AIR FILTER OILS—Harmful corrosive and abrasive dust and moisture entrapped in filter oils, are removed continuously. Fresh make-up is held to a minimum.

RESIDUAL FUEL OILS—Sharples removes the unburnables from Bunker C and other residual oils—making these low cost oils a cheap, efficient diesel fuel.

Write Sharples—Headquarters for Oil Purification

Bulletin 1264 will be sent upon request

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ciple of differential expansion of solids and includes such features as snap action electrical contacts, cast aluminum waterproof housing, easy temperature adjustability and close operating differentials.

The temperature sensing element consists of a high expanding outer tube and a low expanding inner member. Relative motion of these, caused by temperature changes, is multiplied by a lever which actuates a micro switch. A dial, graduated 1 to 10, together with an adjusting screw with pointer and a locking set screw are provided for changing the temperature settings.

New Literature

Re-Refining Used Oil

Scot Mfg. Co., 1412 W. Glenoaks Blvd., Glendale 1, Cal., is making available literature on its various models of oil re-refiners. The re-refiners are claimed to recover from 85 to 90 per cent oil, requiring only 3 min of labor to start and 5 min to change the filter paper after each 25 qt batch. The re-refined oil will be returned to its viscosity or if various grades of oil are mixed, to the average viscosity of the mixed oils.

The units will also remove any additives remaining in the used oil and it is stated that while it may be necessary to fortify a new oil with an additive, there is not the same need in re-refined oil. Cost of re-refining 50 gal of used oil in the Scot Mobile unit, a portable model, is as follows: 25 lb of activated clay (Retrol), $1.25; filter aid (HY flo), $.32; filter paper, $.50; 3 gal fuel oil (1 hr run), $.30. The total comes to $2.37 or 4¾ cents a gal.

Nordberg Supairthermal Engines

Publication of a new 8-page, 2-color bulletin containing construction and operating data on its 4-cycle Supairthermal V-type stationary and marine engines is announced by Nordberg Mfg. Co., Milwaukee 1, Wis.

The 13-in bore and 16½-in stroke engines as described in the bulletin are built to meet demand for a high power heavy-duty diesel, dual-fuel or spark-fired gas engine of moderate weight and small dimensions. Specifications present the weight and ratings of both the 12- and 16-cyl engines which cover a range from 2400 to 4260 hp at 450 to 600 rpm.

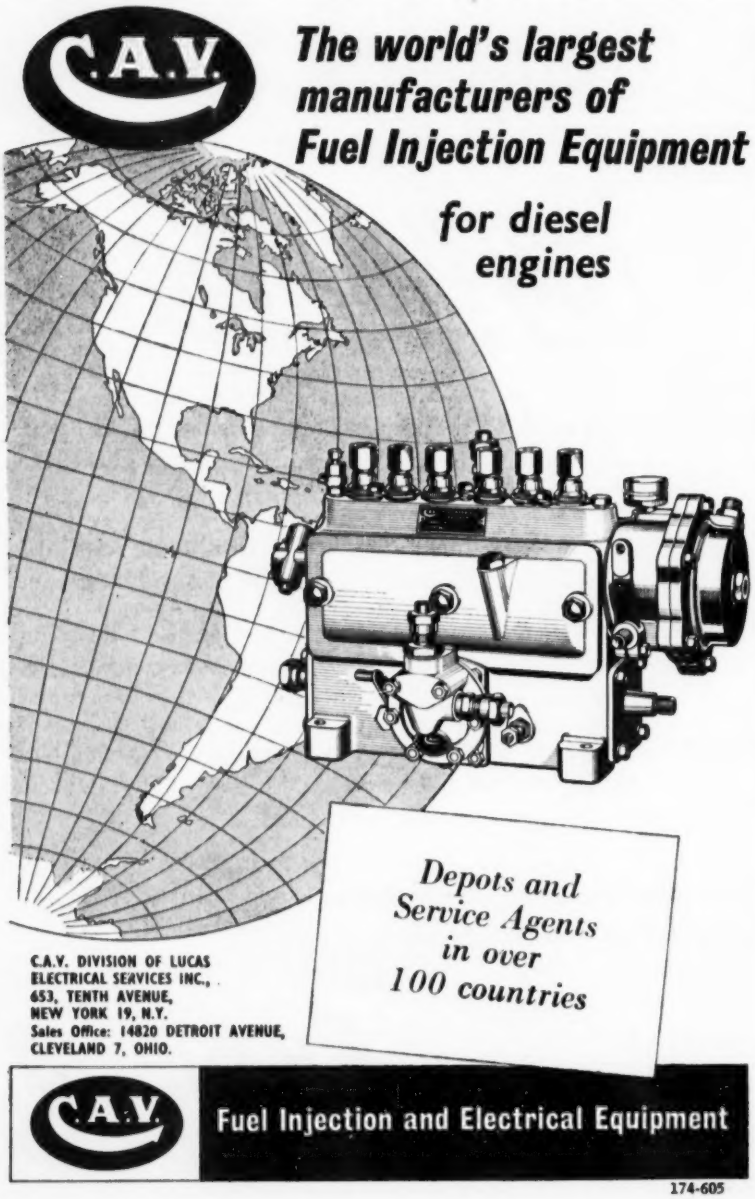
Information is given on the pressure lubricating system and fuel systems for oil and/or gas operation. A schematic cross-section shows design and arrangement with all principal parts identified. Dimensional line drawing for stationary and marine engine types are also presented.

Diesel Fuel Filtration

The Winslow Engineering Co., 4069 Hollis St., Oakland, Cal., has issued a folder on its filters for all types of fuels. The filters will remove solid particles, neutralize acids, and remove moisture, all of which are injurious to engines.

Carbon Monoxide Hazards

While diesel exhaust gas is relatively free from carbon monoxide in comparison to gasoline engine exhaust this toxic gas can be dangerous if not guarded against. "Carbon Monoxide, Your Car, and You", by Andrew J. White, Director of Motor Vehicle Research, 236 Huntington Ave., Boston 15, Mass., is a book which should be of direct interest to everyone operating any power equipment. It describes in detail the hazards of carbon monoxide and their elimination. It sells for $1.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Evaporative Coolers

Evaporative coolers for cooling engine jacket water, lubricating oil, natural gas, etc., are described in a 12-page, 2-color catalog, No. 1952, released by the Young Radiator Co., Racine, Wis.

The illustrated catalog gives mechanical specifications, operating principles, dimensions, capacities, and construction features. Units are designed for operating pressures of 100 psig for water and oil cooling and condensing pressures up to 2000 psig for steam or natural gas cooling. A supplementary catalog, No. 1953, which describes the basic design of evaporative gas coolers, is also available.

Maintenance of Control

An 8-page manual entitled "Proper Maintenance of Control" has been published by Allis-Chalmers Mfg. Co., 960 S. 70 St., Milwaukee 1, Wis.

The pamphlet gives helpful suggestions for overcoming some of the most frequent difficulties common to most electrical control devices and contains a handy control trouble-shooting chart for quick reference showing symptom, possible cause, and cure. Back page carries a listing of 26 suggested points to check for assuring satisfactory preventive maintenance of this equipment.

Lubricating Pumps

Following two years of field test, Eco Engineering Co., 14 New York Ave., Newark 5, N. J., is offering bronze impeller, positive displacement pumps for the handling of oils and greases, with maximum capacity of 10 gpm.

Their positive displacement delivery is the result of two axially oscillating impellers which deliver flow without foaming or air entrainment. The sintered bronze powder-metal impellers act like oilless bearings operating in a lubricating medium. They absorb oils and retain them, minimizing the dangers of heat seizures and scorched impellers.

The pumps are self-priming in low temperature and are suitable for operating oil temperatures up to 500°F. They may also be operated submerged and will pump in either direction and in any position.

Test Specifications

Delco-Remy, Div. of General Motors, Anderson, Ind., announces the 1953 edition of the "DR-324S Test Specifications" booklet. The booklet has been revised to include the most recent specifications for all active models of the division's distributors, generators, cranking motors, regulators, and magnetic or solenoid switches. It is published for those engaged in the maintenance and testing of automotive electrical equipment in the service field and sells for 25¢, with a special price for quantity orders.

GM Diesel Oilfield Engines

A new catalog covering the entire line of General Motors' diesel engines for drilling and other oilfield uses has been published by the Detroit Diesel Engine Div., 13400 W. Outer Dr., Detroit 28, Mich.

Included in the 40-page book, is complete information on the recently-introduced Twin 6-110 diesel with

NO DIESEL IS TOO LARGE OR TOO SMALL
TO USE THE FULL ECONOMY OF A - - - - - -

Briggs
PIONEERS IN MODERN OIL FILTRATION
OIL FILTER

DIESEL TRACTORS
From 80 Hours to 500 Hours

"2 years ago we installed Briggs on a Tournapull and after three months decided to equip 9 more PLUS other tractors. On our TD-24 International Diesel we upped oil and refill life from 80 to 500 hours."

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DIESEL QUARRY TRUCKS — 24 HOUR OPERATION

"Before installing Briggs we were getting 80 hours on a refill and 480 hours on oil—now with Briggs we get 1040 hours on both filter and oil."

Nazareth Cement Company
Nazareth, Pennsylvania

BIG RAILROAD LOCOMOTIVES — SOUTHERN RAILWAY

"A large percentage of our diesel locomotives, both road and switcher type, have been equipped with Briggs cellulose refills for lube oil filtration for several years. We have found them to be satisfactory."

Southern Railway System
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MARINE DIESEL OPERATION — 100% BRIGGS

3200 H.P. Diesel M/V Jos. Chotin

"All of our towboats and barges are 100% equipped with Briggs filters. Engine performance is tops. Refill and oil life excellent."

Chotin Towing Company
New Orleans, Louisiana

It's just plain common sense to entrust valuable engines to one of the oldest names in the field — BRIGGS for over a quarter of a century.

THE BRIGGS FILTRATION CO., RIVER ROAD, WASHINGTON 16, D. C.

newly-designed GM torque converters and other units which can be compounded to meet oilfield requirements up to 2000 hp. The book is illustrated with views of the various models, application shots, performance curves, and contains detailed specifications.

Cummins-Powered Euclids

Five Cummins diesels and 17 standard models of the equipment they power are described in a 16-page booklet recently released by the Euclid Road Machinery Co., Cleveland, Ohio.

Entitled "Cummins Powered Euclid Equipment", the booklet describes the 165-hp HRB-600, 180-hp HRBB-600, 200-hp NHB-600, 275-hp NHBS-600, and 300-hp NHRBS-600 Cummins diesels in Euclid equipment ranging from the 15-ton rear-dump to the 40-ton bottom-dump haulers.

Sheppard Diesel Brochure

A new brochure illustrating and specifying applications of Sheppard diesel industrial tractors equipped with Baker-Lull Shoveloaders has been issued by Sheppard and may be obtained by writing Department KP, Baker-Lull Corp., 376 W. 90 St., Minneapolis 11, Minn.

The 2-color literature lists chief features of the equipment together with attachments available and specifications for all models. Applications of the Shoveloader and special economy features of diesel operation are also outlined.

Connect-Disconnect Couplers

A technical catalog has been prepared by Snap-Tite, Inc., 201 Titusville Rd., Union City, Pa., on its quick connect-disconnect couplers.

The new "Hi Flow" line of the company is discussed including such features as up to 80 per cent flow, greater reduction in coupler weight, higher pressure and temperature applications, interchangeability, and greater diameter sizes. The couplers are said to be able to handle air, water, oil, gas, steam, and most chemicals.

Maintenance for Small Plants

The Small Defense Plants Administration, Old Washington Post Bldg., 1337 E St., N. W., Washington, D. C., is offering a new leaflet, "Improving Maintenance Operations in Small Plants", designed to aid the small businessman.

The new leaflet, No. 25 in a series of 4-page aids issued bi-weekly, highlights main factors to be considered. Under separate headings it discusses plant maintenance functions, policy, kinds of duties involved, records, and housekeeping. A checklist of 60 questions is included.

Insulation Resistance Testing

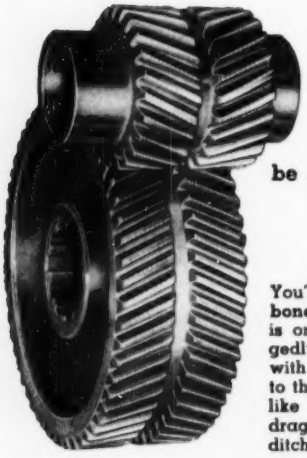
A 50-page manual on practical insulation resistance testing has been issued by Associated Research, Inc., 3758 W. Belmont Ave., Chicago 18, Ill., designed around the use of the company's Vibrotest insulation testing instruments.

Directions are given for testing many specific types of equipment and systems and the value of continuous record-keeping is discussed. Plain language is used and the manual is written in a how-to-do-it style. Free copies will be sent to owners of the instruments and are available to others for 50¢ each.

(*Continued on Page* 111)

When you buy an engine

take a good look at the gears

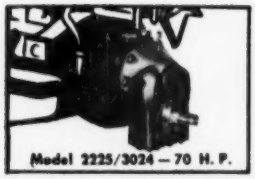


be sure they are S-N REDUCTION GEARS

You'll find the world famous S-N heavy duty herringbone Reduction Gears wherever heavy duty equipment is on a continuous, grueling assignment. They are ruggedly designed for efficient, around-the-clock operation with all types of engines from 40 H.P. units right on up to the 775 H.P. giants! This means heavy duty equipment like cranes, pumps, locomotives, shovels, generators, draglines, compressors and all types of dredging and ditching equipment.

They Ease You Through the Tough Ones

S-N herringbone Reduction Gears are especially designed to transmit full power from engine to load smoothly — at the most economical speed for the driven equipment. Rugged—compact—and versatile—S-N heavy duty herringbone Reduction Gears deliver more power per gallon of fuel than any other method of speed reduction. Standard ratios available in 1.5:1, 2:1, 2.5:1, and 3:1 in both anti-engine and engine rotation. Special ratios available in some models up to 4.7:1. S-N engineers will gladly assist you in specifying the best unit for maximum performance on your equipment.


Model 2225/3024 — 70 H. P.

Model 2255/3054 — 245 H. P.

Model 2275/3175 — 730 H. P.

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Transmission Engineers

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INDUSTRIAL DIVISION

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For FUEL TRANSFER and HYDRAULIC GOVERNOR Service

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MODEL L PUMPS ARE PERFORMANCE-PROVED

Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

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Get Rid of Dirty Oil . . .
Get Lower Operating Costs,
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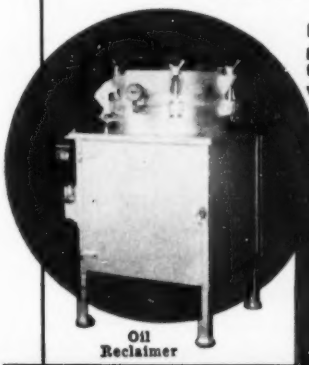
HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all time reduces down time, increases production and HILCO units pay for themselves in savings.

HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

• *THERE'S A* **HILCO** *FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM*



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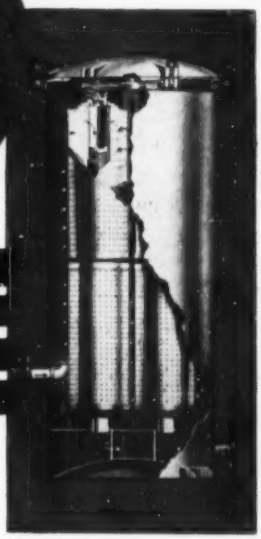

- PURIFIERS
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A complete range of sizes and systems for oil purification.

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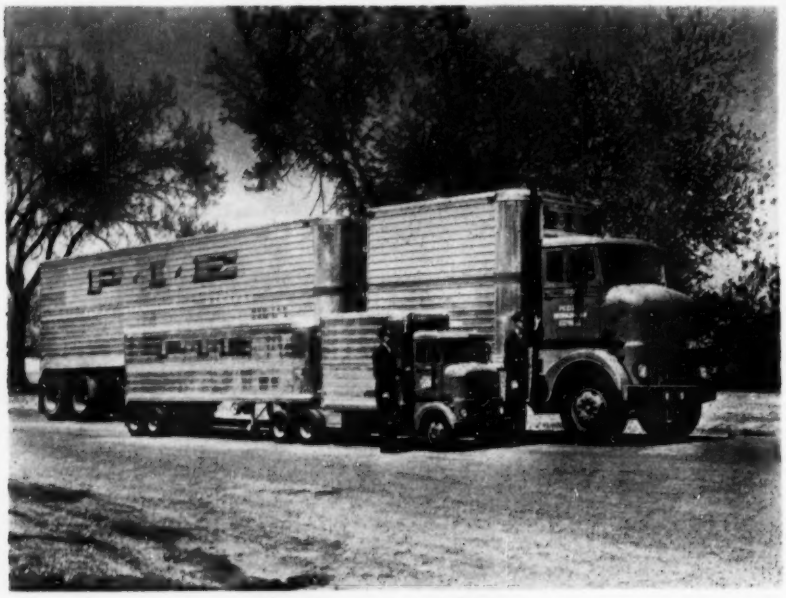
Field Notes



"Mighty Mite"

Although only half the size of its big brother, the "Dromedary" type tractor semi-trailer combination, the "Mighty Mite" has an important job. Its mission is that of a highway safety educational unit.

The cargo carried by this miniature over-the-road rig consists of a complete set of driver testing apparatus which may be used to indicate personal driving ability. In addition to this, a picture display of safety precautions and practises that should be applied to everyday driving is also carried. Testing equipment and displays are transported by this scale model rig to military establishments, schools, and other civic and service groups.

Tests are given through the courtesy of Pacific Intermountain Express in an effort to make safer drivers and safer highways. PIE's "Mighty Mite" has been constructed as close to half-scale as possible. However, unlike its larger diesel-powered counterpart, "Mighty Mite" is powered by a jeep engine.

British Diesel Makes Debut

A new British diesel engine, especially developed for use in American and Canadian trucks, buses, and other commercial vehicles, made its North American debut at the Canadian International Trade Fair recently. Named the R6, it is a 6-cyl unit with a 4½-in stroke and 4-in bore, giving 108 bhp at 2700 rpm and was designed to meet highway cruising speeds of 60 mph and greater. Weight per bhp is a little more than 8 lb.

The engine has instantaneous push-button cold starting by means of 2-series connected 12-v batteries, and for exceptionally cold conditions heaters are incorporated in the induction manifolds with a priming pump. Main and big end borings are pre-finished and replaceable in service without necessity of boring or scraping operations. Aluminum die castings are used wherever possible.

B&O Studies Radio Isotopes

The Baltimore and Ohio Railroad is now engaged in setting up a testing program, using a radio isotope of cobalt, which promises a quicker and more efficient method for inspecting defects in railroad equipment. The atomic by-product is said to offer versatile and reliable inspection without necessity for dismantling heavy equipment

Engine wear may be tested, for example, by incorporating a small amount of the isotope on the surface of a bearing. The slightest amount of wear may then be detected by examining the oil bath for radioactivity. Another application would be in testing castings. For this a sheet of x-ray film is taped to one side of the casting and a capsule of cobalt on the other. Radiation from the cobalt will sensitize the film and any flaws will show up in the film.

Another railroad use of radioactive cobalt has been applied by the Denver, Rio Grande and Western Railroad for the maintenance of rails. Maintenance of the long Moffat tunnel in Colorado is a problem because of corrosive action of the atmosphere. Testing of the rails with the isotope has increased service life while assuring rail failure detection.

Proposed Standard Piston Rings

Some time ago, at a meeting between ring manufacturers and diesel engineers, it was revealed that lack of standards on piston rings above the SAE diameter limit have resulted in much confusion and increased cost due to tooling and special setup as well as lack of interchangeability. A committee of ring manufacturers was organized to draw up ring standards, for the diameter range above 8 in, to serve as a ring guide for future engine designs. The use of these standards for present engines or service replacement, however, was realized as impossible unless incorporated when piston replacements were made.

Since the range of ring sizes considered is beyond the scope covered by the SAE, and since the diesel field is well covered by the Oil and Gas Power Division of the ASME, the committee requested that their proposed standard be made an ASME standard and it was submitted to the ASME

Board approved this as an ASME Standards project.

Members of the ASME committee consisted of H. G. Braendel, Wilkening Mfg. Co.; R. W. Hoyt, Double Seal Ring Co.; C. J. Kremer, Jr., C. Lee Cook Co.; Stuart Nixon, Sealed Power Corp.; and K. W. Pennington, Koppers Co.

The tentative standards have been published, and were recommended for the control of width, radial wall thickness, groove root diameter, and for the definition as to types and nomenclature of piston rings.

Ring width was defined as the dimension between the upper and lower sides of the ring. Radial wall thickness was defined as the dimension between the face and the back of the ring. The maximum groove root diameter was recommended to be so specified that the maximum radial wall thickness ring would not protrude beyond the smallest piston land when the ring is bottomed in the groove. Beyond this requirement, it was desired to keep the clearance to a minimum.

It was also recommended that all ring groove diameters, whether for compression or oil control rings, be the same. As for ring clearances, a general recommendation could not be made since the minimum allowable end clearances depend entirely upon the requirements of the specific application and service. Piston ring nomenclature was illustrated by diagrams for confined ring state, free ring state, load at diameter, and tangential load.

Diesel Operators Courses

Under the sponsorship of the Diesel Engine Manufacturers Assn., four midwestern universities will conduct courses for operators of stationary diesel plants within their states.

Iowa State College plans to hold its Fourth Diesel Power Plant Conference, July 20-22. Among subjects scheduled for discussion are: "Some Trends in Diesel Engine Design" by Robert Cramer, Jr., Nordberg Mfg. Co.; "Piston Rings for Modern Diesel Power Plants" by John A. Worthington, Koppers Co., Inc.; "Lubricating Oil Additives" by Donald G. Reed and C. C. Brittain, Sinclair Refining Co.; "Turbochargers — Application, Operation and Maintenance" by M. L. Land, Elliott Co., Inc.; "Engine Pressure Indicators—What They Tell You" by Frederick B. Kruger, Bacharach Industrial Instrument Co.; "Bearings—Application and Maintenance" by R. E. Hayes, Fairbanks, Morse & Co.; "Governor Adjustments and Maintenance" by Walter J. Evans, Woodward Governor Co.; and, "Governor Tear-Down" by Walter J. Evans, Woodward Governor Co.

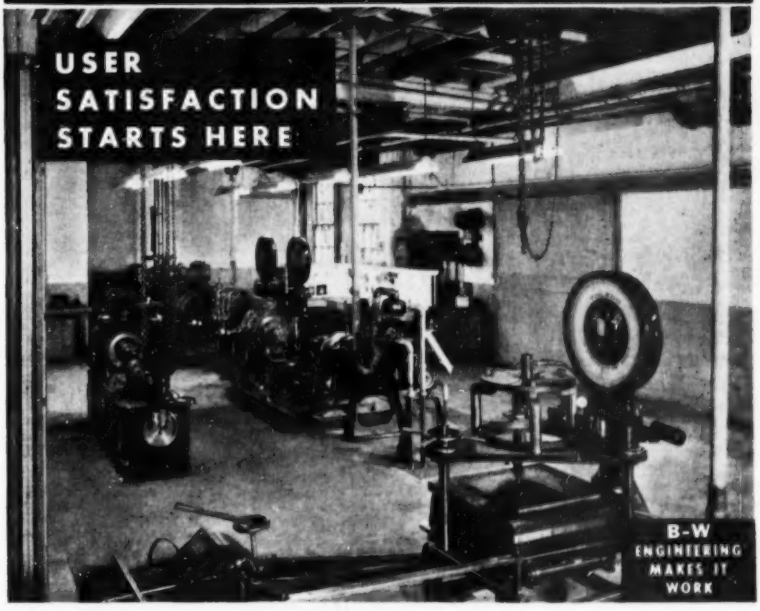
The University of Wisconsin will hold its sessions October 6-8; University of Nebraska, October 15-17; and Oklahoma A&M College, November 2-4. Programs for these courses are still in the process of preparation.

Southern Railway is Deiselized

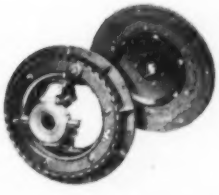
The 8000-mile Southern Railway System became completely dieselized recently when the last steam locomotive in service pulled a freight train into Chattanooga, Tenn., and the fire was knocked from its firebox.

"It has taken us 123 years to put out that fire", Southern's president

ROCKFORD CLUTCHES



Every type and size ROCKFORD CLUTCH must pass torque, strength, pressure, spin, heat, balance, wear, deflection, friction, run-out, flatness and endurance tests before being put into production. These torture tests are made on specially designed, accurate, clutch-checking machines. Let our engineers give *your* products the benefit of ROCKFORD test-proved CLUTCH reliability.



B-W PRODUCTION MAKES IT AVAILABLE

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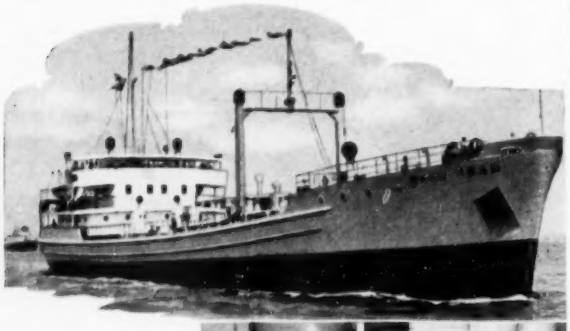
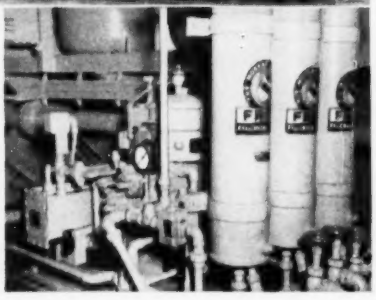
1301 Eighteenth Avenue, Rockford, Illinois, U. S. A.

FRAM FILTERS
help protect new engines

***Owl's Head*, City of New York sludge boat, uses Fram Filters combined with De Laval Puri-Filter to purify lubricating oil for Fairbanks-Morse diesel engines.**





Lubricating oil is cleaned by Fram Filcron Filters and De Laval Centrifuge . . . circulated under pressure through diesels by engine-driven pumps.

AS part of an expanding sewage disposal program, the City of New York has put a new sludge boat, *Owl's Head*, into full service. In constant use regardless of weather, her diesel engines must be protected to insure dependable operation at all times. To help guard those engines, Fram Filcron Filters, used as part of the De Laval Puri-Filter, were installed.

Solve *Your* Filtering Problems with FRAM!

Whatever your filtering problem—lube or fuel—Fram Filters are the solution. Let Fram's Engineering Department PROVE that Fram Filters remove all engine-killing contaminants one micron (.000039") and larger . . . keeping oil clean even after maximum use. You'll find that Fram Filters pay for themselves by lowering your operating costs—reducing wear on liners, rings, and bearings, increasing time between overhauls, cutting rate of oil consumption. Make your diesels produce at top efficiency for the lowest possible cost . . . write TODAY to the FRAM CORPORATION, Providence 16, R. I. *In Canada:* J. C. Adams Co., Ltd., Toronto, Ontario.

FRAM *Filcron*

THE MODERN OIL FILTER

Dependability...
proven on ordnance combat vehicles

The *BEST* Choice For Your Needs

If you're concerned with the design of lubricating oil or cooling systems for jet, heavy-duty gasoline or diesel engines it will pay you to specify DETROIT Vernatherm Engine Thermostats. For only DETROIT Engine Thermostats give you the assurance of dependable, efficient operation performance proven on military and commercial aircraft . . . on ordnance combat vehicles . . . and on most diesel makes and models. So take advantage of this outstanding record—specify DETROIT Vernatherm Engine Thermostats, the true standard of the industry for rugged, exacting service! Available as engine cooling thermostats, oil cooler thermostats, shutter thermostats and thermostatic power elements.

All DETROIT Vernatherm Engine Thermostats are . . .

- *Designed to work with either open or closed cooling systems*
- *Built with tight seats for minimum leakage*
- *Not affected by barometric pressure*
- *Not subject to chatter*

ESTABLISHED IN 1877 AS DETROIT LUBRICATOR COMPANY

DETROIT-*Controls* CORP.

DETROIT 8, MICHIGAN Division of American Radiator & Standard Sanitary Corporation

Canadian Representatives in Montreal, Toronto, Winnipeg—Railway & Engineering Specialties, Ltd.

AUTOMATIC CONTROLS for REFRIGERATION

AIR CONDITIONING • DOMESTIC HEATING • AVIATION TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER

CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Harry A. DeButts revealed as he announced the end of the steam motive power era on his railroad. He was referring to the first steam locomotive placed in regular scheduled railway service in December 25, 1830, on one of the system's predecessor lines.

The railway first began dieselizing in 1939 when it bought six 750-hp diesel-powered passenger units. Eight diesel switching locomotives were purchased in 1940, and in 1941 the Southern put in service "the world's first diesel road freight locomotive".

Since World War II, the rise of the diesel on the Southern has been rapid with diesels being added at a rate that often exceeded 100 units a year. Cost of the 330 modern diesel locomotive units which have made the railroad an all-diesel system is estimated to be in excess of $123 million.

Internat'l Harvester to Inherit Bucyrus-Erie Tractor Equipment

Arrangement has been announced under which Bucyrus-Erie industrial tractor equipment will be sold, distributed, and serviced by International Harvester and eventually will be manufactured by Harvester. Financial details are not available.

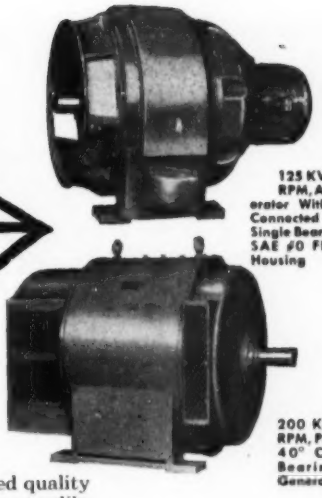
Under the agreement, Bucyrus-Erie will continue to supply Harvester distributors directly until January 1, 1954. After that date Harvester will take over sales, distribution and servicing of the equipment, purchasing its requirements from B-E up to the limits of its present tractor equipment capacity, and reselling to Harvester distributors. Over a period of time and without interrupting continuity of production, Bucyrus-Erie will discontinue manufacture of its present line and Harvester will manufacture these products.

RR Dieselization Benefits Still Not Realized—White

Railroads now face their most challenging task in connection with dieselization, William White, president of the New York Central System, told the annual convention of the mechanical division of the Association of American Railroads recently.

"Up until now many of the benefits we have been getting from dieselization have been relatively easy to

Powerful Companions for Your Engines



125 KVA, 1200 RPM, A.C. Generator With Direct Connected Exciter, Single Bearing With SAE #0 Flywheel Housing

200 KW, 900 RPM, Protected 40° C, Two Bearing D.C. Generator

● For over 25 years Columbia has furnished quality built generators for engine drive. They're sturdily built with materials of the highest quality to provide dependable power.

Your needs can be supplied promptly, whether your requirements are for single bearing generators with or without adaptor for SAE flywheel housing, or for units with two bracket bearing design. A.C. ratings 6.25 to 1000 KVA, D.C. ratings 2 to 300 KW. Our engineers will be glad to review your requirements.

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LEADING DIESEL ENGINES HAVE Manzel FORCE FEED LUBRICATORS

A Fulton type KS Diesel equipped with Manzel Model 94 Lubricator

...THEY CORRECTLY LUBRICATE EACH POINT

Manzel Lubricators supply the *exact* amount of oil needed at each wearing point, reducing oil consumption as much as 90%.

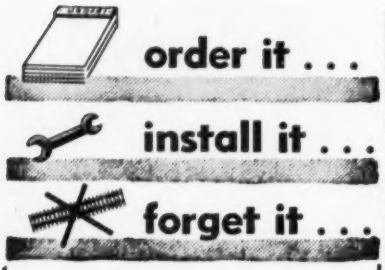
They are furnished as standard equipment on leading makes of engines, and machinery. Or they can be installed on your present equipment.

We will gladly have a Manzel lubricator engineer submit recommendations without obligation. Just write...

Why it Pays to Select Manzel Lubricators

- THEY LENGTHEN THE LIFE OF MACHINERY
- THEY ARE AUTOMATIC AND TROUBLE-FREE
- THEY ELIMINATE "DOWN TIME"
- THEY CUT OIL CONSUMPTION UP TO 90%

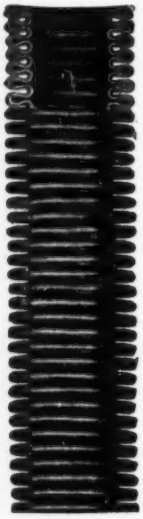
Manzel 271 BABCOCK STREET BUFFALO, NEW YORK



You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

Bronze, Steel, Stainless Steel, Monel — ⅛"—36" I.D. with fittings as needed.



Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

ATLANTIC

METAL HOSE CO., INC.

109 West 64th St.,

New York 23, N. Y.

What Do You Know!

(Answers to Questions on Page 52)

1. Correct answer is "b". The ability of the dual-fuel engine to start on oil and run on it, either totally or in varying percentages, is important in dead-plant starting or in case of inadequate gas supply. See the article on Page 36 for details.

2. Correct answer is "c". Because of the utilization of waste heat in the sludge digestion process, thermal efficiency in New York City's sewage plants is exceeding 70 per cent. See article above.

3. "a" is correct. See the article on Page 80 for illustrations of this and other types of failures along with preventive measures.

4. Correct answer is "b". Fairbanks-Morse's O-P engine is operating as a dual-fuel engine as well. For the details of the first dual-fuel application in municipal power generation service see the article starting on Page 75.

5. "c" is the least pertinent answer. Bulk of power on utility networks is supplied by highline with diesel power plants providing the other three items mentioned. See the article on Page 50 for details.

6. Correct answer is "c". It is important that corrosion inhibition of the antifreeze be checked as otherwise the cooling system may have no protection. Inhibitor life will vary with different conditions and even the manufacturer cannot predict it with certainty. Where large quantities of antifreeze are involved, it is worthwhile to run tests as mentioned in the article above.

7. Correct answer is "a". Currently available automatic controls can meet just about any reasonable requirement. See Page 48 for details.

8. Correct answer is "a". Recirculation without cooling speeds engine warmup. For details see Page 78.

How much **of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?***

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload **Preignition**
Scaled Jackets **Clogged Ports**
Detonation **Faulty Injection**

Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

Get Full information—Quickly! Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.

ILLINOIS TESTING LABORATORIES, INC.
Room 507, 420 N. La Salle St., Chicago 10, Illinois

secure," he stated. "By reason of its very characteristics, the new form of power has given us greatly increased utilization, greater fuel efficiency, and improved performance. These advantages are of tremendous importance; but we must not become complacent about them, or conclude that we have gone as far as we need to go."

"The really hard work, as far as diesels are concerned, is still ahead," Mr. White said. As an example, he pointed out that "the art of diesel maintenance is still in its relative infancy. Taking care of our diesels is going to be an increasingly important factor in railroad operating expenses as the years go by. We'd better make the right decisions now, as we lay our programs and build our shops."

He warned that "there is no reason to expect, within the foreseeable future, any new developments comparable to dieselization as a factor in cutting costs of railroad operation. The hope for future economies lies in many smaller, less spectacular innovations." He urged wider application of "industrial engineering principles, borrowing and adapting techniques from some of the other mass-production industries as well as developing new ones of our own."

Viscosity of Gases Research

To provide data needed for design of gas turbines and jet engines, the National Bureau of Standards is conducting a broad program of research on the viscosity of gases at elevated temperatures and pressures. Hydrocarbon mixtures and combustion products composed of various proportions of nitrogen, carbon dioxide, argon, oxygen, carbon monoxide, and water vapor are being studied.

In the course of this work, J. C. Westmoreland of the NBS staff, developed a flowmeter which accurately controls and measures the flow of very small volumes of gas, such as those required in a small capillary tube viscosimeter. As a result, it has been possible to obtain data hitherto unavailable on the viscosity of pure gases and their mixtures.

Accurate data on viscosity of gases are required in designing transmission and measurement system for fuel gases and in constructing gas-flow systems. Because the viscosity of a gas is an important factor in rate of heat transmission between gases and metals, gas-viscosity data are also needed in the design of gas turbines and jet engines. With continued development of new engines of this kind, need for information on viscosity of exhaust gases at high temperatures is becoming increasingly important. NBS has undertaken to determine the viscosity of pure gases and gas mixtures at pressures from 5-to 10,000-lb, in and over the temperature range from 60°F to 2500°F.

Automatic Recording Device

The Petro-Mechanics Research Div. of the Borg-Warner Corp announces it has devised an automatic recording device which can be lowered into even the deepest oil wells. It forms part of a conventional drill string and records forces on various parts of the drill, measuring the impact resulting from contact of the drill and the formation and also recording temperatures, stresses, pressures, and mud velocities.

Dr. Maurice Nelles, director of the company's research laboratory, said that this equipment will permit scientists and engineers to obtain data required for design of better drilling equipment. The equipment contains recording oscillographs which permit making 18 simultaneous measurements over a 3-hr period at the bottom of the oil well. There are no wires leading to the surface.

Diesel Classroom on Rails

The Erie Railroad recently rolled out a brand new training car, a finished diesel laboratory and classroom on rails, converted from a passenger coach. The car includes cutaways of the GM 2-cycle diesel engine and the Alco 4-cycle diesel. Also contained is a model refrigerating unit as well as a full-size refrigerator unit for instruction in operation of new electro-mechanical equipment now being installed in Erie passenger cars.

Air brake equipment in the car simulates the engineer's quarters in the cab. The equipment is independent of the car air brakes and is operated for class instruction. Separate units have been installed for the road and switching locomotives.

SAVE MONEY ON DIESEL UPKEEP

free book tells how . . .

THIS illustrated digest contains a wealth of sound, practical ideas to expedite Diesel maintenance, keep operating costs low and extend equipment life. Gives details on such subjects as:

- Cleaning filters
- Desludging lube oil coolers
- Descaling jacket water coolers
- Degreasing engine parts before repair
- Steam-detergent cleaning
- Plant maintenance cleaning

Manual also discusses tested Oakite procedures for streamlining maintenance in steam control stations and electric power plants.

FREE copy of this 16-page digest yours on request. Consult your local Oakite Technical Service Representative. Or write address below. No obligation.

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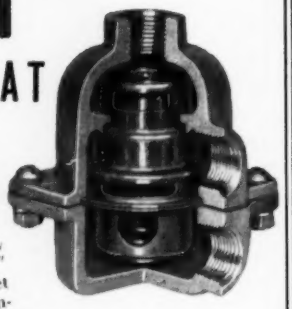
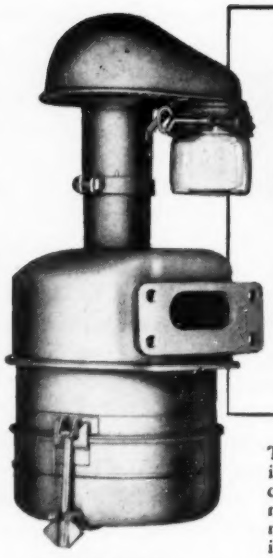
THE NEW
"AMOT"
THERMOSTAT



Here's the NEW Model "C" AMOT

the revolutionary new thermostat in ½" to 1" pipe sizes for jacket water or lube oil control on small engines. The element in the new Model "C" AMOT is entirely new—no bellows or bimetallic springs. Operates like large AMOT models. Quality is the highest, yet price is by far the lowest. AMOT Model "C" is self contained with no external tubes or bulbs. Temperature is set at the factory and cannot be altered or tampered with after installation. Has positive 3-way valve action that turns in exceptionally long life of dependability. Ask for Bulletin #131.

AMERICAN MOTORS CO., RICHMOND, CALIFORNIA



Donaldson Air Cleaners are EASY TO SERVICE!

CUSTOM-BUILT TO FIT YOUR ENGINE

Write our engineering department for air cleaner recomendations.

The simplicity and speed of servicing Donaldson Air Cleaners encourages regular attention by the machine operator. No tools are needed to remove oil cup. Cleaning cup and re-filling with oil is a two-minute job. Removable tray makes cleaning out chaff, lint, leaves and larger foreign particles simple and fast.

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Grinnell Division: Grinnell, Iowa
Donaldson Company (Canada) Ltd., Chatham, Ontario

Donaldson Air Cleaners Mufflers

Other equipment includes a model control board duplicating operation of the electrical system of a diesel locomotive, a cutaway Edison battery and a lead battery to show construction, diesel fire extinguishers, a sound film projector, a slide film projector, a strip film projector, and other educational aids.

Gas Technology Scholarships

Twenty undergraduate scholarships will be offered annually by the Institute of Gas Technology, an affiliate of Illinois Institute of Technology, to help train engineers for careers in the utility gas industry. Applcations are now being accepted for the first 20 scholarships which begin in September 1953.

The scholarships are available to students who have completed their sophomore year at I.I.T. and application may also be made by any student in the United States or Canada. E. S. Pettyjohn, director of the I.G.T., in making the announcement, said, "A graduate of the gas technology program has an excellent opportunity for advancement in this field. The utility gas industry is now the nation's sixth largest industry and is growing rapidly."

Oil Seal to Ease Hotboxes

A new oil seal may solve the difficult hotbox problem railroads face, it was recently learned. Railroad axles, which turn with the wheel, are machined at each end where they fit into the housing. The machined end is called the journal and it bears the full weight of the car with the help of bearings.

If the bearings don't get enough oil, or if the lubricant is contaminated by dirt or water, the assembly overheats. The result is a hotbox. Answer to the problem may be a new face-type oil seal which enables two finely machined parts to spin against each other without losing oil or admitting foreign matter.

Lightning at High Altitude Three Times as Severe

Lightning strokes at 14,650-ft altitude in the Andes are three times as severe as in normal altitudes, it was revealed in a report made before the American Institute of Electrical Engineers, recently. The report was based on lightning studies at Cielo Punto Peak about 150 mi from Lima, Peru, made to determine the effectiveness of lightning protective devices.

However, the report was "not in accord" with other studies in Colorado where lightning strokes were found to decrease in intensity at high altitudes and were believed to be non-existent at 18,000 ft. In the Peru study, it was disclosed that lightning storms at that point in the Andes generally occurred when the weather was about freezing and that the strokes ranged in intensity from 7100 amp to 119,000 amp.

78 More Diesels for Pennsy

Purchase of an additional 78 diesel-electric locomotives at a cost of approximately $13 million has been authorized by Pennsylvania Railroad directors, Walter S. Franklin, president, announced. The engines will be used in road and yard freight switching service.

The new diesels will permit retirement of 109 steam locomotives and will allow for grouping of diesel ownership according to type and make of

locomotive enabling gains in efficiency and economy of operation through concentrated repair facilities and storage of spare parts. Diesels will be used full time with maximum service utility and steam power will be used to augment power for increased traffic needs.

Upon delivery of these engines, the road will have in operation a total of 1426 diesel-electric locomotives, 1984 units of all types, totaling 2,722,670 hp. At that time the diesel fleet investment will represent about $300 million.

Alumnium Ease-Up Foreseen

Contingent on volume of military and stockpile demands, pressure on the civilian aluminum market should be eased in the later months of 1953, the Aluminum Co. of America forecast recently in its Annual Report.

"It is probable," the report states, "that the industry will be unable to satisfy all demands for its products for some months to come. The pressure may be eased during the later months of 1953 because of increasing production capacity."

Pointing out that both military and civilian markets have a stimulated an expansion of the aluminum industry to an all-time high, the report adds, "Since 1939, when total United States primary aluminum production was just over 163,500 tons, the production capacity of the industry has been enlarged nearly nine times. By the end of 1953, the nation's primary aluminum smelting facilities will be able to produce approximately three billion pounds a year."

New F-M Washington Branch

Announcement has been made of the completion of a Seattle, Washington branch house for Fairbanks, Morse & Co. Actually a sub branch of the Portland, Oregon district, the completed facility has a floor area of 9600 sq ft, divided into warehouse, shop, office and repair department space.

Railway Dieselization History

The progressive dieselization of the American railroads offers one of the most interesting industrial developments of the mid-century period. The Association of American Railroads offers this nutshell history as follows:

The first diesel-electric locomotive was placed in switching service on an American railroad in October 1925, but it was not until 1934 that diesel-electric locomotives were first used in passenger-train service. By 1941, they were being used in long-distance freight service.

As late as 1936 the railroads were buying six steam locomotives for every diesel-electric locomotive they purchased. In 1952, for every steam locomotive added to the railway fleet, 130 diesel-electric locomotives were added. At the end of World War II the railroads had in service 2800 diesel-electric locomotives consisting of 3645 units. At the beginning of 1953, these railroads were operating 14,657 diesel-electric locomotives consisting of 20,604 units.

In freight service, the proportion of the total traffic handled by diesel-electric locomotives, measured in gross ton-miles of cars, contents and cabooses, increased from 0.22 per cent in 1941 to 65.12 per cent in 1952. In passenger-train service, diesel-electric locomotives handled 7.75 per cent of total carmiles in 1941. The proportion

G&K DIESEL SERVICE

Offers at LARGE SAVINGS

INTERCHANGEABLE
FACTORY NEW
FIELD TESTED
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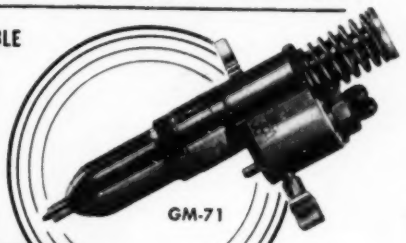
WORLD FAMOUS "FERA"

Imported From Italy



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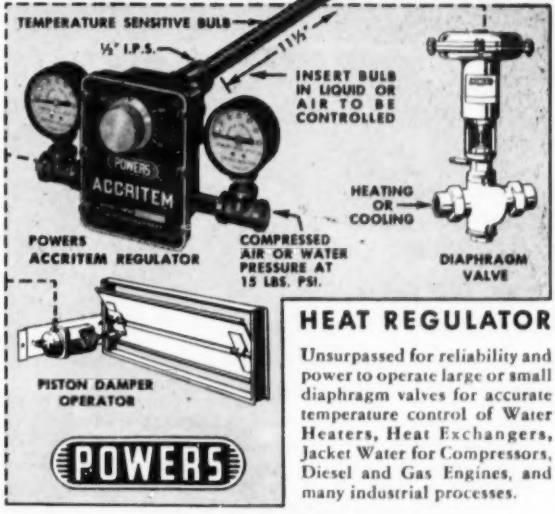

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IMPORTANT FEATURES

● *Adjustable Sensitivity* and over-heat protection. ● *Calibrated Dial* temperature adjustment. ● *Ranges* 50 to 250° F. and 150 to 350° F. ● *Simple, Rugged Construction* withstands vibration and insures many years of reliable service. Requires 15 lb. supply of compressed air or water for its operation. ● *Small Size* — regulator head is only 2⅞" x 3⅝". Write for Bulletin 316. (a76)

THE POWERS REGULATOR CO., 3437 Oakton St., Skokie, Ill.

60 Years of Temperature and Humidity Control • Offices in Over 50 Cities

increased to 71.30 per cent in 1952. In yard service, diesel-electric locomotives accounted for 12.01 per cent of the total locomotive-hours performed in 1941 as compared with 76.39 per cent in 1952.

New Marion Distributor

Marion Power Shovel Co. announces the appointment of Tractors, Inc., 128 Naragansett Ave., Providence, as a new distributor for the entire state of Rhode Island and also southeastern Massachusetts.

New AIEE President

Elgin B. Robertson, president of Elgin B. Robertson, Inc., Dallas, was elected 1953-54 president of the American Institute of Electrical Engineers, a 46,000-member organization. Five vice presidents, three directors, and a treasurer were also chosen.

New Oil Refining Plant

An "ultra-modern" oil refining plant of International Refineries, Inc., near Duluth, Minn., located on a 170-acre site, has begun operations with an initial refinery capacity of ½ million gal of finished products daily.

Among unique features of the design is provision for continuous flow operation through all phases of processing from crude to finished products. The plant is engineered for fully automatic operation with central control station facilities for remote inspection of critical conditions at every step of the process. Fluid catalytic cracking and polymerization equipment are included in processing stages.

Anaconda Engineer-Training Program to Meet Shortage

Step one in an industrial engineering training course, 13-weeks long, has been completed at the Anaconda Wire & Cable Company's Hasting-on-Hudson mill to meet the shortage of technical men. The program is designed to develop an adequate group of skilled industrial engineers within the organization.

The course included class lectures by experts, use of manuals and texts, laboratory practice and demonstrations, motion picture films, practice on actual mill operations, individual aid and consultation, and, of course, class quizzes. The trainees, 15 in all, were selected on the basis of previous experience, training and job performance. Some had been doing industrial engineering work; others demonstrated their ability in other fields. For example, one man, who had been a clerk in the purchasing department, now after the course, has been assigned as an industrial engineer.

World's Longest Oil Pipeline

Canadian oil developments have made necessary additional construction to put into operation what is to be the world's longest crude oil pipeline, it was disclosed recently. Lakehead Pipe Line Co. announces it will begin immediate construction and complete by December 1953, a 635-mi, 30-in pipeline system from Superior, Wis. to the St. Clair River, south of Port Huron, Mich.

Lakehead is a subsidiary of Interprovincial Pipe Line Co. which in 1950 built the original 1130-mi pipeline system from Edmonton, Alta. to Superior. When completed the system will be 1765-mi long, spanning one-half of the North American continent.

It is so designed that with one pump station at Superior its initial capacity will be 120,000 bbl a day.

Star Performers For High Pressure

500 Series
Rotary Geared Pumps
with Herringbone Gears

These quality-built Brown & Sharpe pumps are particularly suited for diesel pressure lubricating systems up to 500 p.s.i. Needle bearing construction, combined with balanced herringbone gear design, assures smooth, dependable operation at high speeds. Leakage problems eliminated by use of double self-balancing mechanical seal . . . no glands to adjust. Six sizes available with capacities from 5.1 to 37.6 g.p.m. at 0 lbs pressure. Operating characteristics fully described in Pump Catalog. Write for copy. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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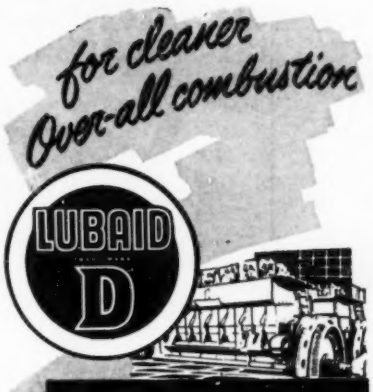

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Organizational News

Sun Oil Retirement

A. Ludlow Clayden, an authority on fuels and internal combustion engines, retired recently after 31 years of service with Sun Oil Co. He joined the company in 1922 as chief automotive engineer.

In 1948 he became head of the automotive laboratory at Marcus Hook, Pa. refinery and in February of this year became technical associate in the chemical research and development department. Immediately prior to joining Sun, he was general consultant to U.S. Cartridge Co. in Massachusetts.

New Roots-Connersville Head

Dresser Industries, Inc. announces the appointment of Ralph R. Newquist to the position of president and general manager of the Roots-Connersville Blower Div. He succeeds R. H. Owens who will be chairman until he retires later this year.

Mr. Newquist came to the division in 1946 as vice president in charge of sales. Since 1951 he has been executive vice president. Before joining the company he was manager of the Washington, D.C. office of Allis-Chalmers.

New Sharples Research Director

Sharples Corp. Research Laboratories announces the appointment of Dr. Edward M. Redding to director of research. He takes over the post held by Philip P. Sharples, who continues as vice president in charge of research.

Dr. Redding comes to the company from the Charles F. Kettering Foundation where he has been director of research since 1948. Principal efforts under his direction were in solar energy and photosynthesis, toward development of a commercial process for converting solar energy into useful power.

Dr. Edward M. Redding

During World War II, Dr. Redding was in the power plant design branch of the U.S. Navy Bureau of Aeronautics where his principal activities included research in combustion and high temperature alloys. Following the war, he was assistant director of the aerophysics laboratory of North American Aviation and then did research on the Lexington Project at M.I.T.

Detroit Diesel Reassignments

The Detroit Diesel Engine Div. of General Motors Corp. has announced several changes in the assignments of its field sales and service personnel.

A. W. Anderson, formerly factory sales representative in New Orleans, has been transferred to the Los Angeles area in the same capacity. He is succeeded by Ralph Pontius, former factory service representative in New

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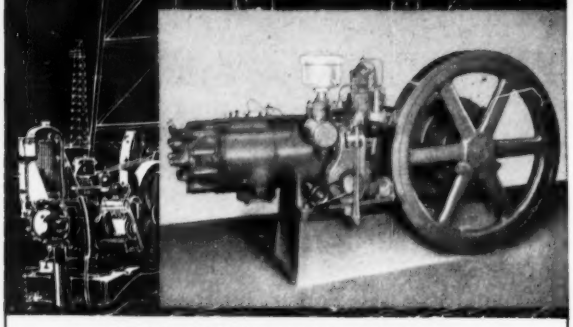
LORAIN Multi-Fuel ENGINES



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Finest Quality Workmanship

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Orleans. Stanley Pillsbury, associated with the division's service training activity, has been assigned to the post vacated by Mr. Pontius.

In other reassignments, Charles Howell, former Los Angeles area sales representative, has transferred to the Tulsa sales office. He will serve as assistant to A. F. Campbell, manager of engine sales to the petroleum industry, succeeding E. J. vanDyke. Mr. vanDyke has been transferred to Detroit as a sales engineering consultant.

Baldwin-Lima-Hamilton Changes

The board of directors of Baldwin-Lima-Hamilton Corp., following its annual organization meeting, announced that present officers of the company have been re-elected with the following changes:

J. F. Connaughton, formerly general manager of the Hamilton Div., was elected vice president in charge of the Eddystone Div. Perry A. White, formerly controller of the Eddystone and Hamilton Divs., becomes general controller of the company to succeed W. Raymond Parshall who has resigned. George E. Mathews was elected controller of the Eddystone Div. and S. F. Schrichte controller of the Hamilton Div. Robert C. McAdoo, formerly assistant secretary and assistant counsel, was elected counsel and assistant secretary of the Eddystone Div.

Ohio Crankshaft Advancements

The board of directors of Ohio Crankshaft Co. has announced the election of W. E. Benninghoff to the post of vice president. He continues as general manager of the TOCCO division.

Until 1935, Mr. Benninghoff was associated with Cleveland Electric Illuminating Co. as a power sales engineer. That year he came to Ohio Crankshaft for the development of high frequency induction hardening of crankshafts.

W. E. Benninghoff

Further action of the board named Foster H. Pettay, a vice president, to the additional post of secretary-treasurer of the company to succeed Francis S. Denneen, co-founder of the company, who recently passed away, and elected C. H. Kimmel, vice president and general manager, a director.

Koppers Names Chief Engineer

Fred A. Robbins has been appointed chief engineer of the piston ring department of Koppers Co., Inc. In this newly created position, he will be in charge of all engineering activities for American Hammered industrial piston rings and will work directly with the company's customers on engineering problems.

Formerly a consultant to the Coordinating Research Council, Mr. Robbins directed analysis during 1953 for full-scale railroad diesel tests. He also served as senior project engineer in

diesel engine development for the Electro-Motive Div. of General Motors, from 1942 to 1952.

Mr. Robbins will work under the direction of John A. Worthington, manager of the piston ring department, and in cooperation with John W. Pennington, executive engineer of the metal products division, on piston ring and related product development as well as on design and material standards. He is active in technical society work, and served in 1952 as national vice chairman, meetings, diesel engine activity, for the S.A.E.

New Federal-Mogul Director

Samuel E. MacArthur, treasurer and controller of Federal-Mogul Corp., has been elected a director of the firm. He succeeds Stafford C. Reynolds who died in April.

Mr. MacArthur joined F-M as assistant controller in 1942, became controller in 1945, and treasurer in 1952. Prior to joining the company, he worked for seven years in various capacities with the U.S. Gypsum Co.

Henry H. Durr

Reo Development Engineer

Reo Motors, Inc. announces that Henry H. Durr has been appointed engine development engineer. During his one and one-half years with the company, Mr. Durr has held the position of industrial and marine engine application engineer and has worked on special project-engine design assignments.

Before coming to Reo, Mr. Durr worked six years in the Inland Div. of General Motors and for the Columbus Bolt Works Co. He spent two years with the Great Lakes Diesel Co. as a sales engineer. He was also employed for two years in the Detroit Diesel Engine Div. of GM.

Hollingshead Promotes Two

Promotion of Joseph L. Laputka to treasurer and secretary and Lloyd L. Entenmann to controller and assistant secretary, was announced by the R. M. Hollingshead Corp.

Rock Island Assignments

Rock Island Lines announces the retirement of Fred J. Schleihs and the appointment of Melvin R. Wilson to succeed him as general superintendent of motive power. Mr. Schleihs, with the road since 1916, has been in his present post a year. Mr. Wilson has been with the railroad's mechanical department since 1923.

Also named to new posts were John D. Loftis, Jr. as assistant general superintendent of motive power at Chicago; Marion C. Sharp to superintendent of motive power at El Reno, Oklahoma; and Clarence H. Gray to master mechanic of the Rock Island and Chicago divisions.

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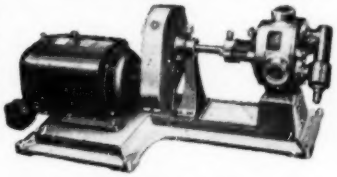

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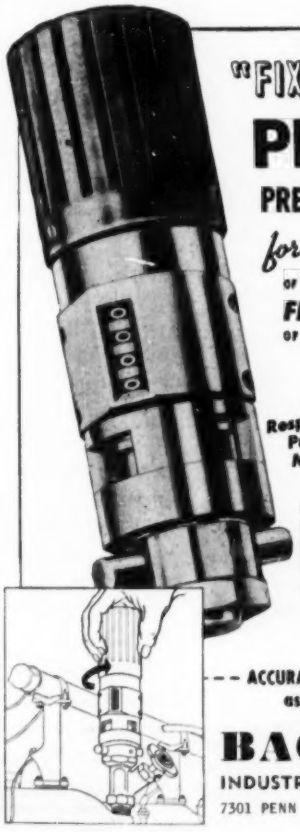

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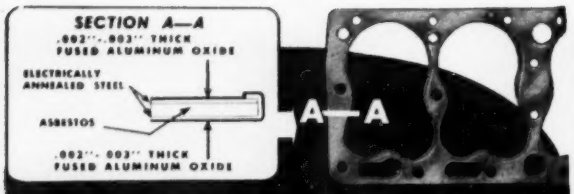

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Cummins Regional Manager

Appointment of Wilmot Sandham as southwestern regional manager with headquarters in Los Angeles has been announced by Cummins Engine Co., Inc. He replaces A. S. Leonard who recently resigned to take over a Cummins dealership.

For the past seven years, Mr. Sandham has been with General Petroleum Corp. and his previous experience also includes work in the East with distributors of diesel engines. In his new position, he will represent the company in California, Nevada, Arizona, and New Mexico.

Elliott Elevations

In recent Elliott Co. elections, M. L. Hiller, who has been a field engineer in the Washington, D. C., district office, has been appointed district manager. He replaces S. K. Hostetter, Jr., who is now sales manager of the Ampere, N. J. plant of the company.

W. S. Carlson has been appointed manager of the Minneapolis district office and H. D. Mateffy becomes branch manager of the Duluth office.

Sealed Power Engineer Dies

Stuart Nixon, an engineer with Sealed Power Corp. for the past 18 years, and a leading member of the American Society of Mechanical Engineers, died suddenly of a heart attack in his 53rd year.

Mr. Nixon graduated from the Massachusetts Institute of Technology with a degree in mechanical engineering, after which he joined Continental Motors Corp. in 1923. He became associated with Sealed Power in 1934. Since then he had held several engineering positions with the company, the latest being that of research engineer, to which post he was appointed in 1950. He developed and patented many piston ring improvements which were assigned to the corporation.

In addition to holding membership in ASME, he was also a member of the Society of Automotive Engineers and the American Oil and Gas Society. He is survived by his wife and two children.

C-B Opens Canada Warehouse

Cooper-Bessemer of Canada Ltd. recently opened its newest branch office and parts warehouse in Edmonton, Canada. Under direction of E. D. Van Fossen, this latest addition to the company is planned to provide prompt factory service on parts for diesel, gas-diesel, and gas engines as well as gas engine-driven compressors.

Mr. Van Fossen comes from the company's district office in Seattle, Washington. He is a factory-trained field engineer and has had extensive experience in many phases of power generation and compressor operation serving the Canadian sector.

Van Norman Promotions

Three executive changes have recently occured in the Van Norman Co. Roger S. Pyne, connected with the organization for 39 years, has been appointed vice president in charge of the machine tool division. Peter Jaremko is now manager of the Washington automotive division, and William J. Kennedy is manager of the Indianapolis automotive division.

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Discarded injector parts & assemblies. 10 to 1000

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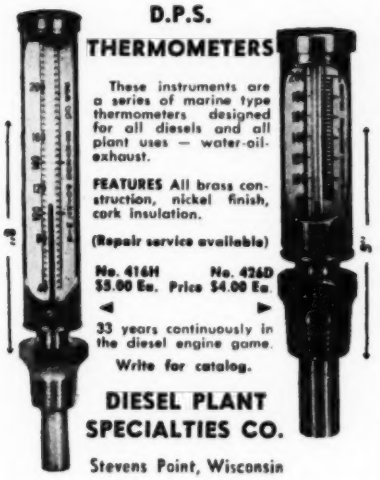

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FEATURES All brass construction, nickel finish, cork insulation.

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A. G. Schoonmaker Co., Inc.
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(Continued from Page 96)

Job Opportunities in Aluminum

The present expansion program of the aluminum industry is adding new employees to its plants and laboratories. "Employment Opportunities in the Aluminum Industry", offered by the Aluminum Assn., 420 Lexington Ave., New York 17, N. Y., briefly outlines the different types of personnel required and the training needed to fill these positions.

Steel Castings Literature

As an outgrowth of its expanded information program, the Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio is lengthening its list of authoritative technical publications. Among these are pamphlets, booklets, manuals, charts, and reprint materials covering varied subject matter in technological progress, products, and processes. Much of this literature is made available without charge on direct request.

Safety Solvents Fact Sheets

A 3-page fact sheet booklet on three types of safety solvents has been published by Octagon Process Inc., 15 Bank St., Staten Island 1, N. Y. These have been expressly developed for cleaning electrical and mechanical equipment where fire and explosive hazards are present and toxic odors are objectionable. Instructions for use and specifications are given.

Self-Aligning Roller Bearings

Bulletin No. 200-C, a catalog of the self-aligning spherical roller bearings made by the Bantam Bearings Div. of the Torrington Co., South Bend 21, Ind., has just been issued.

The bulletin shows the company's complete line of these bearings and includes such engineering data as life expectancy, capacity ratings, life factors, installation and service factors, speed data, loads, fits, lubrication, and other pertinent information. All types are illustrated in cross section.

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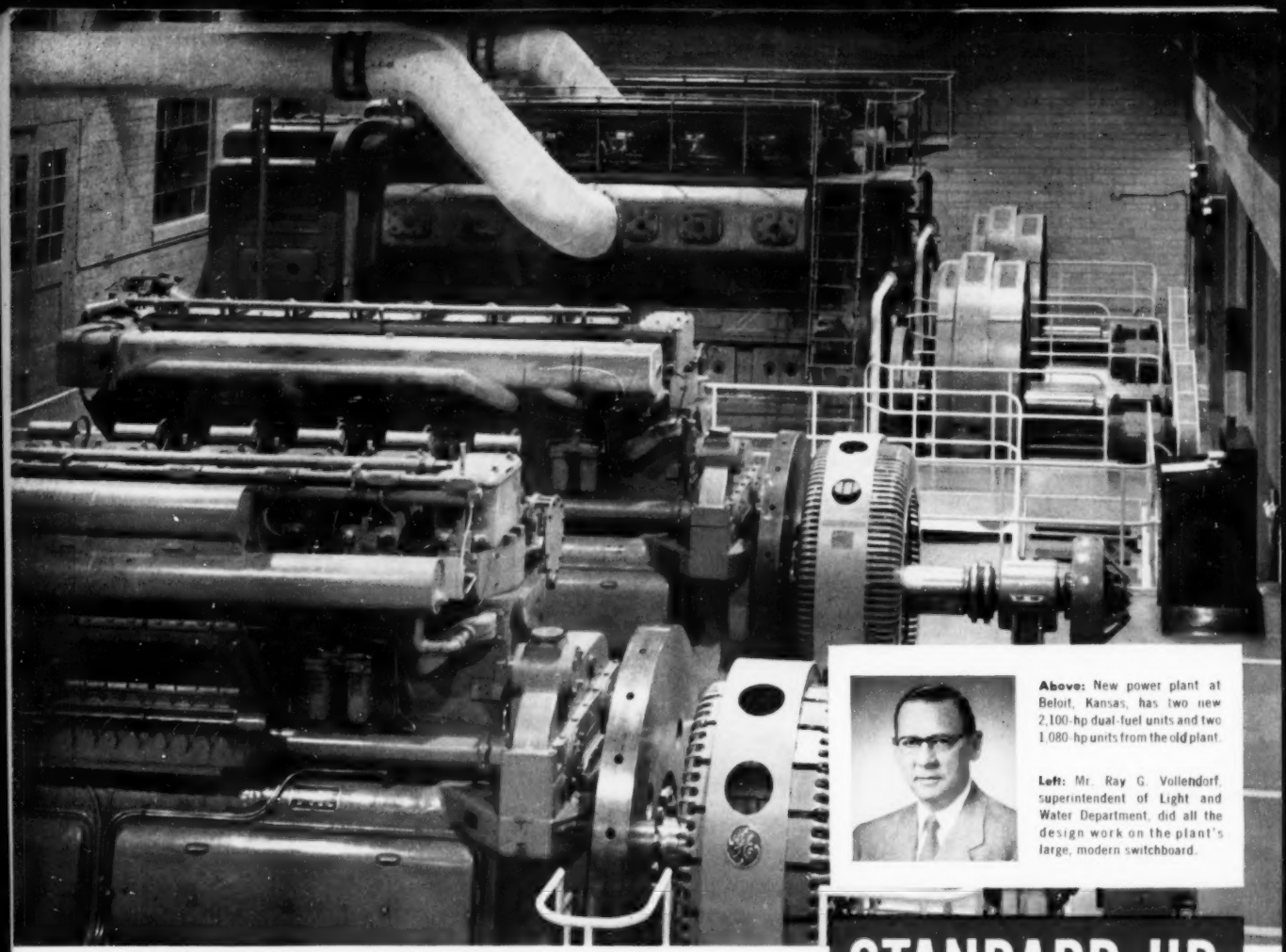

Above: New power plant at Beloit, Kansas, has two new 2,100-hp dual-fuel units and two 1,080-hp units from the old plant.

Left: Mr. Ray G. Vollendorf, superintendent of Light and Water Department, did all the design work on the plant's large, modern switchboard.

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Another decision has brought its reward. To STANDARD HD Oil went the job of lubricating the plant's four diesels. Now, after nearly two years' operation, Mr. Vollendorf reports that crankcases are as clean as the day the diesels were placed in service. No rings or bearings have needed to be replaced. Visibility of tool marks on the rings and the over-all excellent condition of the engines indicate that many more hours of service are possible before any overhaul or replacement of parts will be required.

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